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ANNUAL REPORT

OF THE

LIGHT-HOUSE BOARD

FOR THE

FISCAL YEAR ENDED JUNE 30, 1899.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1899.

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TREASURY DEPARTMENT,
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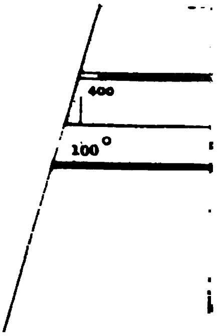

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LIGHT-HOUSE BOARD OF THE UNITED STATES.

Organized in conformity to the act of Congress approved August 31, 1852.

LIST OF MEMBERS ON JUNE 30, 1899.

Hon. **Lyman J. Gage**, Secretary of the Treasury, ex officio President.
Rear-Admiral **Francis J. Higginson**, United States Navy, Chairman.
Col. **Walter S. Franklin**.
Lieut. Col. **Alexander Mackenzie**, Corps of Engineers, United States Army.
Brig. Gen. **George L. Gillespie**, Corps of Engineers, United States Army.
Dr. **Henry S. Pritchett**, Superintendent of the United States Coast and Geodetic Survey.
Capt. **Yates Stirling**, United States Navy.
Commander **Thomas Perry**, United States Navy, Naval Secretary.
Maj. **Richard L. Hoxie**, Corps of Engineers, United States Army, Engineer Secretary.

EXECUTIVE MEMBERS OF THE BOARD.

Rear-Admiral **Francis J. Higginson**, United States Navy.
Commander **Thomas Perry**, United States Navy.
Maj. **Richard L. Hoxie**, United States Army.

OFFICERS IN CHARGE OF LIGHT-HOUSE DISTRICTS ON JUNE 30, 1899.

First District.

Inspector.—Commander **James K. Cogswell**, United States Navy, Portland, Me.
Engineer.—Maj. **William S. Stanton**, Corps of Engineers, United States Army, Boston, Mass.

Second District.

Inspector.—Commander **J. R. Selfridge**, United States Navy, Boston, Mass.
Engineer.—Maj. **William S. Stanton**, Corps of Engineers, United States Army, Boston, Mass.

Third District.

Inspector.—Capt. **E. M. Shepard**, United States Navy, Tompkinsville, N. Y.
Engineer.—Lieut. Col. **David P. Heap**, Corps of Engineers, United States Army, Tompkinsville, N. Y.

Fourth District.

Inspector.—Commander **Adolph Marix**, United States Navy, Philadelphia, Pa.
Engineer.—Lieut. Col. **William A. Jones**, Corps of Engineers, United States Army, Philadelphia, Pa.

Fifth District.

Inspector.—Commander **E. P. Wood**, United States Navy, Baltimore, Md.
Engineer.—Lieut. Col. **William A. Jones**, Corps of Engineers, United States Army, Baltimore, Md.

Sixth District.

Inspector.—Commander **John A. Rodgers**, United States Navy, Charleston, S. C.
Engineer.—Maj. **Ernest H. Ruffner**, Corps of Engineers, United States Army Charleston, S. C.

SEVENTH DISTRICT.

Inspector.—Lieut. Commander NATHANIEL R. USHER, United States Navy, Key West, Fla.

Engineer.—Lieut. Col. A. N. DAMRELL, Corps of Engineers, United States Army, Mobile, Ala.

EIGHTH DISTRICT.

Inspector.—Commander ALBION V. WADHAMS, United States Navy, New Orleans, La.

Engineer.—Lieut. Col. A. N. DAMRELL, Corps of Engineers, United States Army, Mobile, Ala.

NINTH DISTRICT.

Inspector.—Commander CHARLES O. ALLIBONE, United States Navy, Chicago, Ill.

Engineer.—Capt. JAMES G. WARREN, Corps of Engineers, United States Army, Milwaukee, Wis.

TENTH DISTRICT.

Inspector.—Commander FRANKLIN HANFORD, United States Navy, Buffalo, N. Y.

Engineer.—Maj. T. W. SYMONS, Corps of Engineers, United States Army, Buffalo, N. Y.

ELEVENTH DISTRICT.

Inspector.—Commander DUNCAN KENNEDY, United States Navy, Detroit, Mich.

Engineer.—Maj. THOMAS H. HANDBURY, Corps of Engineers, United States Army, Detroit, Mich.

TWELFTH DISTRICT.

Inspector.—Commander URIEL SEBREE, United States Navy, San Francisco, Cal.

Engineer.—Maj. CHARLES E. L. B. DAVIS, Corps of Engineers, United States Army, San Francisco, Cal.

THIRTEENTH DISTRICT.

Inspector.—Commander W. L. FIELD, United States Navy, Portland, Oreg.

Engineer.—Capt. WILLIAM C. LANGFITT, Corps of Engineers, United States Army, Portland, Oreg.

FOURTEENTH DISTRICT.

Inspector.—Commander CHARLES T. FORSE, United States Navy, Cincinnati, Ohio.

Engineer.—Maj. WILLIAM H. BIXBY, Corps of Engineers, United States Army, Cincinnati, Ohio.

FIFTEENTH DISTRICT.

Inspector.—Commander HENRY B. MANSFIELD, United States Navy, St. Louis, Mo.

Engineer.—Lieut. Col. AMOS STICKNEY, Corps of Engineers, United States Army, St. Louis, Mo.

SIXTEENTH DISTRICT.

Inspector.—Lieut. Commander JAMES M. HELM, United States Navy, Memphis, Tenn.

Engineer.—Capt. H. C. NEWCOMER, Corps of Engineers, United States Army, Memphis, Tenn.

CHANGES IN PERSONNEL.

The following changes have taken place in the personnel of the Light-House Board since the date of the last annual report:

1. On July 6, 1898, Commodore F. V. MCNAIR, United States Navy, was succeeded by Commodore RUSH R. WALLACE, United States Navy; on September 22, 1898, Commodore RUSH R. WALLACE, United States Navy, was succeeded by Commodore FRANCIS J. HIGGINSON, United States Navy.
2. On November 9, 1898, Capt. JOHN MILLIS, Corps of Engineers, United States Army, was succeeded by Maj. RICHARD L. HOXIE, Corps of Engineers, United States Army.
3. On April 4, 1899, Commander SETH M. ACKLEY, United States Navy, was succeeded by Commander THOMAS PERRY, United States Navy.

The following-named changes in the personnel of the district officers took place during the fiscal year:

FIRST DISTRICT.

Inspector.—Commander S. W. NICHOLS, United States Navy, to October 10, 1898; Commander JAMES K. COGSWELL, United States Navy, from October 10, 1898.

SECOND DISTRICT.

Inspector.—Commander THOMAS NELSON, United States Navy, to October 22, 1898; Commander H. G. O. COLBY, United States Navy, to March 30, 1899; Commander J. R. SELFRIDGE, United States Navy, from March 30, 1899.

FOURTH DISTRICT.

Inspector.—Lieut. Commander W. H. REEDER, United States Navy, to August 5, 1898; Lieut. Commander G. K. HASWELL, United States Navy, to October 18, 1898; Commander ADOLPH MARIX, United States Navy, from October 18, 1898.

FIFTH DISTRICT.

Inspector.—Commander CHARLES T. HUTCHINS, United States Navy, to August 25, 1898; Commander C. M. THOMAS, United States Navy, to April 17, 1899; Commander E. P. WOOD, United States Navy, from April 17, 1899.

SIXTH DISTRICT.

Inspector.—Commander C. H. ARNOLD, United States Navy, to March 31, 1899; Maj. E. H. RUFFNER, Corps of Engineers, United States Army, to April 24, 1899; Commander JOHN A. RODGERS, United States Navy, from April 24, 1899.

SEVENTH DISTRICT.

Inspector.—Lieut. Commander C. C. CORNWELL, United States Navy, to October 15, 1898; Lieut. Commander NATHANIEL R. USHER, United States Navy, from October 15, 1898.

NINTH DISTRICT.

Engineer.—Lieut. Col. MILTON B. ADAMS, Corps of Engineers, United States Army, to October 6, 1898; Capt. JAMES G. WARREN, Corps of Engineers, United States Army, from October 6, 1898.

TENTH DISTRICT.

Engineer.—Maj. T. W. SYMONS, Corps of Engineers, United States Army, from July 1, 1899.

ELEVENTH DISTRICT.

Inspector.—Lieut. Commander DUNCAN KENNEDY, United States Navy, to August 10, 1898; Commander FRANKLIN HANFORD, United States Navy, to August 31, 1898; Lieut. Commander F. O. DAVENPORT, United States Navy, to October 17, 1898; Commander DUNCAN KENNEDY, United States Navy, from October 17, 1898.

Engineer.—Maj. MILTON B. ADAMS, Corps of Engineers, United States Army, to March 25, 1899; Maj. THOMAS H. HANDBURY, Corps of Engineers, United States Army, from March 25, 1899.

TWELFTH DISTRICT.

Inspector.—Maj. C. E. L. B. DAVIS, Corps of Engineers, United States Army, to July 5, 1898; Capt. GEORGE W. COFFIN, United States Navy, to November 1, 1898; Maj. C. E. L. B. DAVIS, Corps of Engineers, United States Army, to November 10, 1898; Commander URIEL SEBREE, United States Navy, from November 10, 1898.

THIRTEENTH DISTRICT.

Inspector.—Commander JOHN C. MORONG, United States Navy, to October 14, 1898; Capt. GEORGE C. REITER, United States Navy, to June 30, 1899; Commander W. L. FIELD, United States Navy, from June 30, 1899.

Engineer.—Capt. WALTER L. FISK, Corps of Engineers, United States Army, to June 30, 1899; Capt. WILLIAM C. LANGFITT, Corps of Engineers, United States Army, from June 30, 1899.

FOURTEENTH DISTRICT.

Inspector.—Maj. WILLIAM H. BIXBY, Corps of Engineers, United States Army, to March 13, 1899; Commander CHARLES T. FORSE, United States Navy, from March 13, 1899.

FIFTEENTH DISTRICT.

Inspector.—Lieut. A. B. WYCKOFF, United States Navy, to January 20, 1899; Commander HENRY B. MANSFIELD, United States Navy, from January 20, 1899.

SIXTEENTH DISTRICT.

Inspector.—Capt. H. C. NEWCOMER, Corps of Engineers, United States Army, to January 12, 1899; Lieut. Commander JAMES M. HELM, United States Navy, from January 12, 1899.

REPORT

OF

THE UNITED STATES LIGHT-HOUSE BOARD.

TREASURY DEPARTMENT,
OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, D. C., October 2, 1899.

SIR: The Light-House Board has the honor to submit the following report for the fiscal year which ended on June 30, 1899:

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights	1,199
Light-vessels in position	46
Light-vessels for relief	7
Electric-lighted buoys in position	11
Gas-lighted buoys in position	67
Fog-signals operated by steam, caloric, or oil engines	160
Fog-signals operated by clockwork	217
Post lights	1,775
Day or unlighted beacons	475
Whistling buoys in position	70
Bell buoys in position	117
Other buoys in position, including pile buoys and stakes in Fifth district and buoys in Alaskan waters	4,712

In the construction, care, and maintenance of these aids to navigation there were employed:

Steam tenders	33
Steam launches	11
Sailing tenders	3
Light-keepers	1,373
Other employees, including crews of light-ships and tenders	1,249
Laborers in charge of post lights	1,363

NEW LIGHTS.

The following-named lights were established during the fiscal year:

Sandusky Bay (outside) gas buoy, No. 2, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Gull Island Shoal gas buoy, No. 3, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Niagara Reef gas buoy, No. 5, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Mobile Ship Channel (third bend) light No. 3, Mobile Bay, Alabama.—An additional lens-lantern light July 5, 1898.

Apalachicola Bay range (front) light, Florida.—A lantern light July 14, 1898.

Grand Marais Harbor of Refuge range (rear) light-station, Lake Superior, Michigan.—A fifth order light July 15, 1898.

Apalachicola Bay (outer beacon) light, Florida.—A lantern light July 16, 1898.

Tampa Bay (south cut) light, Florida.—A lens-lantern light July 23, 1898.

Tampa Bay (north cut) light, Florida.—A lens-lantern light July 30, 1898.

Entrance gas buoy, No. 1, Fox River, Wisconsin.—A gas-lighted buoy July 30, 1898.

Elbow gas buoy, No. 12, Fox River, Wisconsin.—A gas-lighted buoy July 30, 1898.

Waukegan Harbor beacon light, Lake Michigan, Illinois.—A lantern light August 10, 1898.

Sturgeon Bay Canal beacon light, Lake Michigan, Wisconsin.—A lens-lantern light August 18, 1898.

Middle Ground light, Mobile Bay, Alabama.—A lens-lantern light August 29, 1898.

Breakers Island post light, Hudson River, New York.—A lantern light September 15, 1898.

North Manitou light-station, Lake Michigan, Michigan.—A fourth-order light September 15, 1898.

Georges Island Rocks gas buoy, Boston Harbor, Massachusetts.—A gas-lighted buoy September 16, 1898.

Winslow Wreck gas buoy, Lake Michigan, Michigan.—A gas-lighted buoy September 20, 1898.

Experimental gas and bell buoy, New York Upper Bay, New York.—A combination gas and bell buoy October 10, 1898.

Maumee Bay Straight Channel range light-station, Maumee Bay, Ohio.—Three fifth-order lights October 12, 1898.

Maurice River range light-station, Delaware Bay, New Jersey.—Two lantern lights October 15, 1898.

Great Salt Pond Breakwater (outer end) beacon light-station, Block Island, Rhode Island.—A lens-lantern light October 25, 1898.

Ship Island South Channel range beacon lights, Ship Island Anchorage, Mississippi.—Two lantern lights October 25, 1898.

Rockhall Creek beacon lights, Chesapeake Bay, Maryland.—Three lantern lights November 1, 1898.

Tail Point Pile Cluster beacon light, Green Bay, Wisconsin.—A lantern light November 11, 1898.

Elbow beacon light, Fox River, Wisconsin.—A lens-lantern light November 11, 1898.

Murphys Dock beacon light, Fox River, Wisconsin.—A lens-lantern light November 11, 1898.

Alligator River beacon light, Albemarle Sound, North Carolina.—A lantern light December 1, 1898.

Blockade Shoal beacon light, Croatan Sound, North Carolina.—A lantern light December 1, 1898.

Overfalls light-vessel, No. 46, entrance to Delaware Bay, Delaware.—Two reflector lights December 2, 1898.

South Cut (upper) light, Tampa Bay, Florida.—A lens-lantern light December 15, 1898.

North Cut (upper) light, Tampa Bay, Florida.—A lens-lantern light December 15, 1898.

Ipswich range (front) light, Ipswich Harbor, Massachusetts.—A reflector light February 2, 1899.

Sturgeon Bay Canal light-station, Lake Michigan, Wisconsin.—A third-order light March 17, 1899.

Carlton Island light-station, St. Lawrence River, New York.—A lens-lantern light April 15, 1899.

Satanella Wreck light, New York Lower Bay, New York.—A lantern light April 19, 1899.

Vidal Shoal Channel range light-station, St. Marys River, Michigan.—A fifth and fourth order light April 30, 1899.

Coan River gas buoy, Potomac River, Maryland.—A gas-lighted buoy May 1, 1899.

Vidal Shoal Channel gas buoys, St. Marys River, Michigan.—Three gas-lighted buoys May 8, 1899.

Sands beacon post light, Columbia River, Oregon.—A lantern light May 16, 1899.

Milwaukee Breakwater light-station, Lake Michigan, Wisconsin.—Two lantern lights May 23, 1899.

Grubbs Landing light, Delaware River, Delaware.—A lantern light May 25, 1899.

Western Branch beacon light, Elizabeth River, Virginia.—A temporary lantern light May 26, 1899.

Caravan Wreck gas buoy, entrance to Chesapeake Bay, Virginia.—A gas-lighted buoy June 2, 1899.

Gros Cap Reef gas buoy, head of St. Marys River, Michigan.—A gas-lighted buoy June 5, 1899.

Lower Entrance (west side) light, Lake St. Clair, Michigan.—A lens-lantern light June 13, 1899.

Lower Middle (east side) light, Lake St. Clair, Michigan.—A lens-lantern light June 13, 1899.

Upper Middle (west side) light, Lake St. Clair, Michigan.—A lens-lantern light June 13, 1899.

Upper (east side) light, Lake St. Clair, Michigan.—A lens-lantern light June 13, 1899.

Macedonia Wreck gas buoy, seacoast of New Jersey.—A gas-lighted buoy June 20, 1899.

New Haven Middle Breakwater beacon lights, New Haven Harbor, Connecticut.—Two lantern lights June 28, 1899.

NEW FOG-SIGNALS.

During the fiscal year the following-named fog-signals were established:

Great Salt Pond Breakwater (outer end) beacon light-station, Block Island, Rhode Island.—A blower siren October 25, 1898.

Overfalls light-vessel, No. 46, entrance to Delaware Bay, Delaware.—A 12-inch steam whistle December 2, 1898.

State Ledge electric fog bell buoy, Boston Harbor, Massachusetts.—A bell buoy, sounded by electrical machinery, May 5, 1899.

During the fiscal year fog-signals were established at the following-named existing light-stations:

New Canal light-station, Lake Pontchartrain, Louisiana.—A bell, struck by machinery, July 7, 1898.

Pass Manchac light-station, Louisiana.—A bell, struck by machinery, July 7, 1898.

Amite River light-station, Louisiana.—A bell, struck by machinery, July 7, 1898.

Trinidad Head light-station, seacoast of California.—A bell, struck by machinery, July 15, 1898.

Bridgeport Breakwater light-station, Bridgeport Harbor, Connecticut.—A bell, struck by electrical machinery, July 28, 1898.

Marshall Point light-station, Maine.—A bell, struck by machinery, August 10, 1898.

Romer Shoal light-station, New York Lower Bay, New York.—A bell, struck by machinery, February, 20, 1899.

Grays Harbor light-station, seacoast of Washington.—First-class steam siren March 8, 1899.

LIGHTS DISCONTINUED.

In the course of the fiscal year the following-named lights were discontinued:

Ipswich Range (front) beacon light, Ipswich Harbor, Massachusetts.—A reflector light August 2, 1898.

Covells Folly post light, Hudson River, New York.—A lantern light September 15, 1898.

Navesink light-station (northerly light), entrance to New York Harbor, New Jersey.—A first-order light September 15, 1898.

North end of Centurion gas buoy, Boston Harbor, Massachusetts.—A gas-lighted buoy September 16, 1898.

Nantucket Sound Wreck gas buoy, Massachusetts.—A gas-lighted buoy September 26, 1898.

Maumee Bay range, Maumee Bay, Ohio.—Two lens-lantern lights October 12, 1898.

Wreck of Alvena gas buoy, New York Lower Bay, New Jersey.—A gas-lighted buoy November 8, 1898.

City of Duluth Wreck light, Lake Michigan, Michigan.—A lens-lantern light November 17, 1898.

St. Marys Falls Canal (north pier) light, St. Marys River, Michigan.—A fifth-order light at close of navigation 1898.

Lower Entrance (west side) beacon light, Lake St. Clair, Michigan.—Structure carried away by ice and light extinguished December 8, 1898.

Lower Entrance (east side) beacon light, Lake St. Clair, Michigan.—Structure carried away by ice and light extinguished December 8, 1898.

Middle beacon light, Lake St. Clair, Michigan.—Structure carried away by ice and light extinguished December 8, 1898.

Upper beacon light, Lake St. Clair, Michigan.—Structure carried away by ice and light extinguished December 8, 1898.

Waukegan (Little Fort) light-station, Lake Michigan, Illinois.—A fifth-order light January 1, 1899.

Mayport range (rear) light, St. Johns River, Florida.—A lens-lantern light January 25, 1899.

Sapelo range (front) light, entrance to Doboy Sound, Georgia.—A reflector light January 29, 1899.

Wolf Island range light-station, entrance to Doboy Sound, Georgia.—Two reflector lights January 29, 1899.

Point Adams light-station, mouth of Columbia River, Oregon.—A fourth-order light January 31, 1899.

Timber Island beacon light, mouth of Carrabelle River, Florida.—A lantern light April 6, 1899.

Amelia Island range light-station, entrance to Fernandina, Florida.—Two lens-lantern lights May 15, 1899.

Beacon No. 1 post light, Columbia River, Oregon.—A lantern light May 15, 1899.

Morris Island south range (front) light, entrance to Charleston Harbor, South Carolina.—A lens-lantern light May 20, 1899.

Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.—A lantern light May 20, 1899.

Sullivans Island west and east ranges (rear) light, entrance to Charleston Harbor, South Carolina.—A fourth-order light May 20, 1899.

New Baltimore Dike post light, Hudson River, New York.—A lantern light June 16, 1899.

Schodack Channel post light, Hudson River, New York.—A lantern light June 18, 1899.

CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

Mount Desert light-station Maine.—Characteristic and order of light changed July 2, 1898.

Gloucester Point Wharf post light No. 2, York River, Virginia.—Height of light increased July 14, 1898.

Apalachicola Bay range (rear) light, Florida.—Height increased July 14; color of light changed August 10, 1898.

Maumee Straight Channel Entrance gas buoy No. 1, Lake Erie, Ohio.—Characteristic of light changed August 6, 1898.

Seul Choix Pointe light-station, Lake Michigan, Michigan.—Color of tower changed August 19, 1898.

Craney Island light-station, Elizabeth River, Virginia.—Characteristic of light changed August 20, 1898.

Poydras Hall post light, Mississippi River, Louisiana.—Height of light increased August 22, 1898.

Conimicut light-station, entrance to Providence River, Rhode Island.—Characteristic of light changed by inserting a red sector September 10, 1898.

Knapp Landing post light, Columbia River, Washington.—Moved 1,000 feet downstream September 14, 1898.

North Channel east range (rear) post light, St. Louis Bay, Minnesota.—Color of light changed September 15, 1898.

North and South Channels west ranges (rear for both) post light, St. Louis Bay, Minnesota.—Color of light changed September 15, 1898.

Fairport Pierhead range (rear) light, Fairport Harbor, Ohio.—Height of light and characteristic changed September 23, 1898.

Waukegan Harbor beacon light, Lake Michigan, Illinois.—Color of light changed October 1, 1898.

Romer Shoal light-station, New York Lower Bay, New York.—Changed from lens-lantern to fourth-order light on new tower October 10, 1898.

Maurice River light-station, Delaware Bay, New Jersey.—Characteristic of light changed by inserting a red sector covering the entrance to the river October 15, 1898.

Fairhaven inner light, Little Sodus Bay, Ohio.—Changed from tubular to lens-lantern light October 20, 1898.

Great Salt Pond Breakwater (inner end) beacon light-station, Block Island, Rhode Island.—Color of light changed October 25, 1898.

Butler Flats light-station, New Bedford Harbor, Massachusetts.—Color of tower changed November 8, 1898.

West Chop light-station, Vineyard Sound, Massachusetts.—Color of light changed November 14, 1898.

Diamond Shoal light-vessel, seacoast of North Carolina.—Light-vessel No. 71 replaced by light vessel No. 69 November 24, 1898.

Delaware Breakwater range (rear) light, Delaware Bay, Delaware.—Edge of northeasterly dark sector swung to southward December 12, 1898.

Second Turn gas buoy, Galveston Harbor, Texas.—Characteristic of light changed December 19, 1898.

Jekyl Island range (front) beacon light, Brunswick Harbor, Georgia.—Changed to lens-lantern light December 23, 1898.

Outer beacon light, Apalachicola Bay, Florida.—Intensity of light increased by changing from lantern to lens-lantern December 23, 1898.

Latimer Reef light-station, Fishers Island Sound, New York.—Intensity of light increased by changing from fifth to fourth-order December 24, 1898.

Colonels Island range (front) beacon light, Turtle River, Georgia.—Changed to lens-lantern light December 28, 1898. Changed from a lens-lantern to a lantern light March 24, 1899.

Old Point Comfort light-station, Hampton Roads, Virginia.—Color of light changed March 10, 1899.

Jekyl Island range (front) beacon light, Brunswick Harbor, Georgia.—Changed from a lens-lantern to a reflector light March 24, 1899.

Black River range (rear) light, Lake Erie, Ohio.—Light changed from two red and one white to one red lens-lantern March 27, 1899.

Genesee (Charlotte Harbor) Range (rear) light, Lake Ontario, New York.—Changed to show one red instead of two red and one white light April 2, 1899.

Braddock Point light-station, Lake Ontario, New York.—Arc of illumination of light increased April 4, 1899.

Ashtabula range (rear) light, Lake Erie, Ohio.—Changed to show one red instead of one red and one white light April 11, 1899.

Stingray Point light-station, Chesapeake Bay, Virginia.—Intensity of light increased by substituting a fifth-order for the sixth-order illuminating apparatus April 12, 1899.

Niagara River range (rear) light, Buffalo Harbor, New York.—Light established in new structure and changed to lens-lantern April 27, 1899.

St. Marys Falls Canal (south pier) light, St. Marys River, Michigan.—Changed from fourth-order to lens-lantern light and placed in new structure April 30, 1899.

Presqu'ile light-station, entrance to Erie Harbor (Presqu'ile Bay), Pennsylvania.—Color of tower changed May 10, 1899.

Castle Hill light-station, Narragansett Bay, Rhode Island.—Color of tower changed May 15, 1899.

Point Judith light-station, Narragansett Bay, Rhode Island.—Color of tower changed May 15, 1899.

Montauk Point light-station, seacoast of New York.—Color of tower changed May 15, 1899.

Latimer Reef light-station, Fishers Island Sound, New York.—Color of tower changed May 15, 1899.

Stratford Point light-station, Long Island Sound, New York.—Color of tower changed May 15, 1899.

Execution Rocks light-station, Long Island Sound, New York.—Color of tower changed May 15, 1899.

Petit Point au Sable light-station, Lake Michigan, Michigan.—Color of tower changed May 15, 1899.

Sullivans Island west and east ranges (front) lights, entrance to Charleston Harbor, South Carolina.—Name changed to South Channel range lights May 20, 1899.

Swash Channel range lights, entrance to Charleston Harbor, South Carolina.—Name changed to Main Channel range May 20, 1899.

Moultrieville beacon light No. 2, entrance to Charleston Harbor, South Carolina.—Color changed from red to white and name changed to Mount Pleasant range front light May 20, 1899.

Mount Pleasant beacon light No. 6, entrance to Charleston Harbor, South Carolina.—Color changed from red to white; intensity increased by changing from lantern to lens-lantern, and name changed to Mount Pleasant range rear light May 20, 1899.

New York Slough (east end) post light, San Joaquin River, California.—Structure rebuilt and height of light increased May 28, 1899.

Buffalo Breakwater (north end) light-station, Lake Erie, New York.—Height of light increased May, 1899.

Detroit River light-station, mouth of Detroit River, Michigan.—Color of tower changed June 10, 1899.

Conneaut range (front) light, Lake Erie, Ohio.—Changed from lens-lantern to sixth-order light June 22, 1898.

Conneaut range (rear) light, Lake Erie, Ohio.—Changed from sixth-order to lens-lantern light June 22, 1899.

Delaware Breakwater (east end) light-station, Delaware Bay, Delaware.—Characteristic of fog-signal changed June 25, 1899.

Beavertail light-station, entrance to Narragansett Bay, Rhode Island.—Order of light changed from third to fourth and characteristic of light also changed June 26, 1899.

Palmer Island light-station, New Bedford Harbor, Massachusetts.—Color of light changed June 28, 1899.

Coney Island light-station, entrance to New York Harbor, New York.—Interval between flashes of light reduced June 30, 1899.

Western Branch beacon light, Elizabeth River, Virginia.—Changed from a lantern to a lens-lantern light June, 1899.

North Manitou light-station, Lake Michigan, Michigan.—Tower changed by inclosing two stories June, 1899.

CHANGES IN FOG-SIGNALS.

During the fiscal year the following changes were made in fog-signals:

Bridgeport Breakwater light-station, Bridgeport Harbor, Connecticut.—Characteristic of fog bell changed March 15, 1899.

Seguin light-station, seacoast of Maine.—Characteristic of fog-signal changed March 16, 1899.

Whitehead light-station, entrance to Penobscot Bay, Maine.—Characteristic of fog-signal changed April 10, 1899.

West Quoddy Head light-station, Maine.—Characteristic of fog-signal changed May 15, 1899.

Libby Islands light-station, seacoast of Maine.—Characteristic of fog-signal changed May 15, 1899.

Petit Manan light-station, seacoast of Maine.—Characteristic of fog-signal changed May 15, 1899.

Great Duck Island light-station, seacoast of Maine.—Characteristic of fog-signal changed May 15, 1899.

Cape Elizabeth light-station, seacoast of Maine.—Characteristic of fog-signal changed May 15, 1899.

Portland Head light-station, entrance to Portland Harbor, Maine.—Characteristic of fog-signal changed May 15, 1899.

Ashtabula range (front) light-station, Lake Erie, Ohio.—Fog whistle changed from 6-inch to 10-inch May 25, 1899.

Whaleback light-station, entrance to Portsmouth Harbor, New Hampshire.—Characteristic of fog-signal changed May 29, 1899.

CHANGES IN LOCATION.

During the fiscal year the following-described changes in location were made:

Newburyport Harbor light-station, Massachusetts.—Light moved to new tower 18 feet southeast September 20, 1898.

Great Salt Pond Breakwater (inner end) beacon light-station, Block Island, Rhode Island.—Moved to inner end of breakwater October 25, 1898.

Wolf Island range (front) light, entrance to Doboy Sound, Georgia.—Moved 28 feet southerly November 4, 1898.

Mayport range (front) light, St. Johns River, Florida.—Moved to a point about 1,500 feet east by north from St. Johns River light-house January 25, 1899.

Cape Hatteras beacon light, seacoast of North Carolina.—Moved 435 feet nearer Cape Hatteras light-house February 24, 1899.

Head of Passes (East Jetty) light-station, Mississippi River, Louisiana.—Light moved to new structure March 6, 1899.

Rockland Breakwater light-station, West Penobscot Bay, Maine.—Moved 700 feet southerly March 15, 1899.

Carrabelle range beacon lights, St. George Sound, Florida.—Lights moved to new structures on axis of dredged channel April 6, 1899.

Wade Point light-station, Albemarle Sound, North Carolina.—Moved to new structure 40 feet to the southward April 17, 1899.

Kewaunee Pierhead range (rear) light, Lake Michigan, Wisconsin.—Moved 200 feet east southeasterly April 26, 1899.

Mount Pleasant beacon light No. 6, entrance to Charleston Harbor, South Carolina.—Moved to new structure 120 feet northwesterly and name changed to Mount Pleasant range rear light May 20, 1899.

NEW BUOYS.

During the fiscal year the following named special buoys were established:

Sandusky Bay outside gas buoy, No. 2, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Gull Island Shoal gas buoy, No. 3, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Niagara Reef gas buoy, No. 5, Lake Erie, Ohio.—A gas-lighted buoy July 2, 1898.

Howland Ledge bell buoy, Massachusetts Bay, Massachusetts.—A bell buoy July 25, 1898.

Entrance gas buoy, No. 1, Fox River, Wisconsin.—A gas-lighted buoy July 30, 1898.

Elbow gas buoy, No. 12, Fox River, Wisconsin.—A gas-lighted buoy July 20, 1898.

Georges Island Rocks gas buoy, Boston Harbor, Massachusetts.—A gas-lighted buoy September 16, 1898.

Winslow Wreck gas buoy, Lake Michigan, Michigan.—A gas-lighted buoy September 20, 1898.

Point Delgada bell buoy, Shelter Cove, California.—A bell buoy October 6, 1898.

Experimental gas and bell buoy, New York Upper Bay, New York.—A combination gas and bell buoy October 10, 1898.

Monterey bell buoy, Monterey Bay, California.—A bell buoy April 29, 1899.

Coan River gas buoy, Potomac River, Maryland.—A gas-lighted buoy May 1, 1899.

State Ledge electric fog-bell buoy, Boston Harbor, Massachusetts.—A bell buoy, sounded by electrical machinery, May 5, 1899.

Vidal Shoal Channel gas buoys, St. Marys River, Michigan.—Three gas-lighted buoys May 8, 1899.

St. Johns River entrance bell buoy, St. Johns River, Florida.—A bell buoy May 13, 1899.

Off Point Vincente whistling buoy, San Pedro Channel, California.—A whistling buoy May 22, 1899.

Caravan Wreck gas buoy, entrance to Chesapeake Bay, Virginia.—A gas-lighted buoy June 2, 1899.

Gros Cap Reef gas buoy, head of St. Marys River, Michigan.—A gas-lighted buoy June 5, 1899.

Macedonia Wreck gas buoy, seacoast of New Jersey.—A gas-lighted buoy June 20, 1899.

Sand Spit bell buoy, New Bedford Harbor, Massachusetts.—A bell buoy June 28, 1899.

BUOYS DISCONTINUED.

In the course of the fiscal year the following-named special buoys were discontinued:

North end of Centurion gas buoy, Boston Harbor, Massachusetts.—A gas-lighted buoy September 16, 1898.

Nantucket Sound wreck gas buoy, Massachusetts.—A gas-lighted buoy September 26, 1898.

Wreck of Alvena gas buoy, New York Lower Bay, New Jersey.—A gas-lighted buoy November 8, 1898.

South Shoal whistling buoy, No. 4, entrance to Delaware Bay, Delaware.—A whistling buoy December 9, 1898.

St. Helena whistling buoy, entrance to St. Helena Sound, South Carolina.—A whistling buoy April 9, 1899.

Entrance bell buoy, entrance to Charleston Harbor, South Carolina.—A bell buoy May 20, 1899.

South Jetty bell buoy, entrance to Charleston Harbor, South Carolina.—A bell buoy May 20, 1899.

Entrance bell buoy, Winyah Bay and Georgetown Harbor entrance, South Carolina.—A bell buoy June 1, 1899.

TEMPORARY CHANGES IN AIDS TO NAVIGATION.

The following temporary changes were made in aids to navigation during the fiscal year:

Tillamook Rock light-station, seacoast of Oregon.—Sounding of fog siren discontinued from July 1 to July 30, 1898, owing to scarcity of water.

Upper Mile Point Cut post light, M 6, St. Johns River, Florida.—Structure carried away and light extinguished July 10; structure again carried away and light extinguished October 2; structure rebuilt and light reestablished October 24, 1898.

Sandy Hook light-vessel, entrance to New York Lower Bay, New York.—Light-vessel No. 51 removed for repairs and relief light-vessel No. 16 placed on station July 12; relief light-vessel No. 16 withdrawn and light-vessel No. 51 replaced October 13, 1898.

Hog Island light-station, seacoast of Virginia.—Characteristic of light restored July 12, 1898.

Wind Point (Racine Point) light-station, Lake Michigan, Wisconsin.—Characteristic changed July 15; restored July 25, 1898.

Oyster Beds (front) beacon light, Savannah River, South Carolina.—Structure destroyed by fire July 17; light reestablished July 22, 1898.

Lake St. Clair Twenty-foot Channel upper beacon light, Michigan.—Lantern light reestablished July 21, 1898.

Lake St. Clair Twenty-foot Channel middle beacon light, Michigan.—Lantern light reestablished July 21, 1898.

Mine Field bell buoy, Hampton Roads, Virginia.—A bell buoy established July 29; discontinued September 5, 1898.

Cornfield Point light-vessel, Long Island Sound, Connecticut.—Light-vessel No. 48 replaced on station and relief light-vessel No. 20 withdrawn August 2; characteristic of light on foremast changed to fixed white, owing to damage by collision, August 27, 1898; light-vessel No. 48 withdrawn from station for repairs and replaced by relief light-vessel No. 20 September 1; light-vessel No. 48 replaced on station and relief light-vessel No. 20 withdrawn October 12, 1898.

Lower Mines gas buoy, Hampton Roads, Virginia.—A gas-lighted buoy established August 3; discontinued September 5, 1898.

Handkerchief light-vessel, Nantucket Sound, Massachusetts.—Light-vessel No. 4 withdrawn from station for repairs and replaced by relief light-vessel No. 9 August 18; light-vessel No. 4 replaced and relief light-vessel No. 9 withdrawn September 10, 1898.

Martins Industry light-vessel, off Port Royal entrance, South Carolina.—Light-vessel No. 53 replaced on station and relief light-vessel No. 29 withdrawn August 20, 1898.

Limekiln Crossing light-vessel (south) No. 64, Detroit River, Michigan.—Withdrawn from her station, owing to damage by collision, August 29; replaced on station September 7, 1898. Temporary float light shown during withdrawal.

Wing Dam No. 10 post light, Savannah River, Georgia.—Structure carried away and light discontinued August 31; structure rebuilt and light reestablished September 26, 1898.

Broad Sound wreck gas buoy, Massachusetts.—A gas-lighted buoy September 6; discontinued October 3, 1898.

Wreck bell buoy, Savannah River, South Carolina.—A bell buoy established September 7; discontinued October 26, 1898.

Fairport Pierhead range (rear) light, Fairport Harbor, Ohio.—Structure knocked down and light extinguished by collision September 13; temporary light established September 17; light reestablished September 23, 1898.

Chapel Hill Range Cut electric buoys, New York Lower Bay, New Jersey.—Spar buoy showing lantern light substituted September 14, 1898.

Southwest Ledge light-station, entrance to New Haven Harbor, Connecticut.—Sounding of Daboll fog trumpet resumed September 15, 1898.

Alice C. Jordan wreck gas buoy, Vineyard Sound, Massachusetts.—A gas-lighted buoy established September 20; discontinued September 29, 1898.

Nantucket Shoals light-vessel, Massachusetts.—Light-vessel No. 66 withdrawn from her station for repairs and replaced by relief light-vessel No. 58 September 26; light-vessel No. 66 replaced on station and relief light-vessel No. 58 withdrawn November 3, 1898.

Bird Island light-station, Buzzards Bay, Massachusetts.—A lens-lantern light shown in place of fifth-order light from September 28 to September 30, 1898.

Southwest end of Middle Ground bell buoy, Pensacola entrance, Florida.—Blown ashore in September; replaced on station October 22, 1898.

Wing Dam No. 28 post light, Savannah River, Georgia.—Structure destroyed and light extinguished by passing vessel September 28; structure rebuilt and light reestablished November 4, 1898.

Morris Island north range (front) light, entrance to Charleston Harbor, South Carolina.—Structure carried away in gale and temporary light established October 2, 1898.

Wolf Island range light-station, entrance to Doboy Sound, Georgia.—Lights extinguished owing to damage by gale October 2; reestablished November 30, 1898.

Sapelo range light station, entrance to Doboy Sound, Georgia.—Lights extinguished owing to damage by gale October 2; reestablished October 13, 1898.

St. Simon Range front beacon light, entrance to St. Simon Sound, Georgia.—Structure carried away and light extinguished October 2; temporary light established October 11; structure rebuilt and permanent light established October 27, 1898.

Plantation Creek range (front) beacon light, St. Simon Sound, Georgia.—Structure carried away and light extinguished in gale October 2; rebuilt and light reestablished October 10, 1898.

Jekyl Island range (front) beacon light, Brunswick Harbor, Georgia.—Structure carried away and light extinguished in gale October 2; temporary light established October 21; permanent light reestablished December 23, 1898; structure destroyed by fire March 24; rebuilt and light reestablished.

Colonels Island range (front) beacon light, Turtle River, Georgia.—Structure carried away and light extinguished in gale October 2; temporary light established October 21; permanent light reestablished December 28, 1898. Structure destroyed by fire and light extinguished March 24, 1899; rebuilt and light reestablished.

Amelia Island range light-station, Fernandina entrance, Florida.—Structures destroyed and lights extinguished in gale October 2, 1898; lights reestablished January 5, 1899.

Tiger Island north range light-station, Cumberland Sound, Florida.—Lights extinguished October 2, 1898, owing to damage by gale; lights reestablished January 7, 1899.

Tiger Island south range light-station, Amelia River, Florida.—Lights extinguished owing to damage by gale October 2, 1898; lights reestablished January 7, 1899.

Great Marsh Island Shoal post light No. 1, St. Johns River, Florida.—Structure carried away and light extinguished in gale October 2; light reestablished November 4, 1898.

Rawlestown post light No. 74, St. Johns River, Florida.—Damaged by gale October 2; rebuilt October 28, 1898.

Fernandina whistling buoy, entrance to Cumberland Sound, Florida.—Broke adrift in gale of October 3; replaced on station November 3, 1898.

Entrance bell buoy, Cumberland Sound, Florida.—Broke adrift in gale of October 3; replaced on station November 3, 1898.

Bridgeport Breakwater light-station, Bridgeport Harbor, Connecticut.—Striking of fog bell discontinued October 5, 1898; reestablished March 15, 1899.

Penfield Reef light-station, Long Island Sound, Connecticut.—A bell struck by machinery substituted for Daboll fog trumpet October 7; sounding of fog trumpet resumed November 7, 1898.

Richard Hall Wreck light, Long Island Sound, New York.—A lantern light established October 10; discontinued December 18, 1898.

Plum Beach light-station, Narragansett Bay, Rhode Island.—Striking of fog bell discontinued October 11, 1898; resumed July 1, 1899.

Gedney and Bayside range cut electric buoys, New York, N. Y.—Extinguished October 17, relighted October 24; extinguished December 4, relighted December 12, 1898; extinguished February 13 on account of running ice, relighted February 23 and 28; extinguished March 20, relighted March 22; extinguished March 29, relighted April 4, 1899.

Wreck gas buoy, New York Lower Bay, New York.—A gas-lighted buoy established October 17, 1898; discontinued January 20, 1899.

NOTE.—Gas buoy replaced lantern light established October 5, 1898, and carried away.

Fort Carroll light-station, Patapsco River, Maryland.—Fog-signal changed from bell struck by machinery to bell rung by hand October 17 to December 30. Changed October 17 from fifth-order to lens-lantern light, owing to removal of tower. Fifth-order light reestablished and lens-lantern light discontinued December 30, 1898.

Sapelo whistling buoy, Sapelo Sound entrance, Georgia.—Reported out of order October 19; replaced by a new buoy November 3, 1898.

Emily Baxter Wreck light, Kill van Kull, New York.—A lantern light established October 21; discontinued November 3, 1898.

Fort Gratiot range (rear) light-station, St. Clair River, Michigan.—Rear structure carried away in gale of November 11, 1898, and temporary front light established; lights reestablished April 25, 1899.

Upper beacon light, Lake St. Clair, Michigan.—Structure carried away by vessel and light extinguished November 16; rebuilt and light reestablished November 23, 1898.

South gas buoy, Galveston Harbor, Texas.—Light extinguished November 17; relighted December 20, 1898. Extinguished April 6; relighted April 15; extinguished May 25; relighted July 1, 1899.

Inner gas buoy, Galveston Harbor, Texas.—Light extinguished November 17; relighted December 19, 1898.

Outer entrance whistling buoy No. 2, entrance to Chesapeake Bay, Virginia.—Disappeared from station November 18; replaced on station December 7, 1898.

Great Round Shoal light-vessel, entrance to Nantucket Sound, Massachusetts.—Light vessel No. 42 withdrawn from station for repairs and replaced by relief light-vessel No. 58, November 23, 1898; light-vessel No. 42 replaced on station and relief light-vessel No. 58 withdrawn January 3, 1899.

Avery Ledge bell buoy, Rockport Harbor, Massachusetts.—Broke adrift in gale of November 26 and 27, 1898; replaced on station January 20, 1899.

Cape Ann whistling buoy, seacoast of Massachusetts.—Broke adrift in gale of November 26 and 27; replaced on station December 23, 1898.

Outer Breakers (Great Pig Rocks) bell buoy No. 4, Boston Bay, Massachusetts.—Broke adrift in gale of November 27, 1898; replaced on station January 20, 1899.

Northeast Grave whistling buoy, Boston Bay, Massachusetts.—Broke adrift in gale of November 27, 1898; replaced on station January 26, 1899.

Great Faun Bar bell buoy, Boston Harbor, Massachusetts.—Carried away in gale of November 26 and 27; replaced on station December 15, 1898.

Boston light-vessel, Boston Bay, Massachusetts.—Dragged out of position in gale November 26 and 27; replaced November 29, 1898.

Off Gurnet Point whistling buoy, entrance to Plymouth Harbor, Massachusetts.—Carried away in gale of November 26 and 27; replaced on station December 17, 1898.

Peaked Hill Bar whistling buoy, off Cape Cod, Massachusetts.—Broke adrift in gale of November 27, 1898; replaced on station January 24, 1899.

Chatham Bar whistling buoy, seacoast of Massachusetts.—Carried away in gale of November 26 and 27; replaced on its station December 24, 1898.

Broken part of Pollock Rip (north part) bell buoy, entrance to Nantucket Sound, Massachusetts.—Carried away in gale of November 26 and 27; replaced on station December 2, 1898; adrift and replaced on station March 27; adrift May 12, and replaced on station May 13, 1899.

Northeast Slue Channel (Pollock Rip) whistling buoy, entrance to Nantucket Sound, Massachusetts.—Carried away in gale of November 26 and 27; replaced on station December 17, 1898; found adrift and replaced on station March, 27, 1899.

Pollock Rip Slue gas buoy, entrance to Nantucket Sound, Massachusetts.—Light extinguished in gale of November 26 and 27; relighted December 17, 1898.

Pollock Rip light-vessel, entrance to Nantucket Sound, Massachusetts.—Broke adrift from her moorings and carried to sea November 26 and 27; replaced on station December 13, 1898.

Light-vessel No. 47.—Withdrawn from station for repairs and replaced by relief light-vessel No. 58 June 16, 1899.

NOTE.—Light vessel returned to station, and relief light-vessel No. 58 withdrawn July 15, 1899.

Entrance bell buoy (Orion Shoal), entrance to Nantucket Sound, Massachusetts.—Carried away in gale of November 26 and 27, 1898; and replaced on station.

Off Nantucket Bar bell buoy, Nantucket Sound, Massachusetts.—Carried away in gale of November 26 and 27; replaced on its station December 27, 1898.

Handkerchief light-vessel, Nantucket Sound, Massachusetts.—Dragged her moorings in gale of November 26 and 27; replaced on station December 4, 1898.

Quicks Hole bell buoy, Vineyard Sound, Massachusetts.—Carried away in gale of November 26 and 27; replaced on its station December 24, 1898.

Hen and Chickens light-vessel, Vineyard Sound, Massachusetts.—Broke adrift in gale of November 26 and 27; replaced on her station December 9, 1898.

NOTE.—Station marked by gas-lighted buoy December 2 to 9, 1898.

Hog Island Shoal light-vessel, Narragansett Bay, Rhode Island.—Light vessel No. 12 withdrawn from station for repairs and replaced by light-house tender *Cactus*, December 2; light-vessel No. 12 replaced on station and light-house tender *Cactus* withdrawn December 3, 1898.

Purtan Bay post light, No. 1, York River, Virginia.—Structure carried away and light extinguished December 2, 1898; light reestablished February 9; structure carried away by ice and light extinguished February 13; structure rebuilt and light reestablished March 22, 1899.

Bar bell buoy, entrance to Tampa Bay, Florida.—Carried away in gale of December 4; replaced on station December 27, 1898.

Frying Pan Shoals light-vessel No. 1, seacoast of North Carolina.—Broke adrift from her station December 5; replaced December 7, 1898.

Boon Island Ledge whistling buoy, seacoast of Maine.—Carried from its station December 6; replaced December 15, 1898.

Jerrys Point beacon light, entrance to Little Harbor, New Hampshire.—Extinguished December 7; relighted December 12, 1898.

Gowanus Flats experimental bell buoy, New York Upper Bay, New York.—Established December 10; discontinued December 27, 1898.

North gas buoy, Galveston Harbor, Texas.—Light extinguished December 10; reestablished December 30, 1898; extinguished February 26; relighted April 1; extinguished May 13; relighted July 1, 1899.

Isle aux Peches front beacon light, Lake St. Clair, Michigan.—Structure carried away by ice and light extinguished December 10, 1898; reestablished on the opening of navigation, 1899.

Second Turn gas buoy, Galveston Harbor, Texas.—Extinguished and withdrawn from station December 13; relighted December 19, 1898; extinguished March 9; relighted April 1; extinguished May 10; relighted June 24, 1899.

Succonnesset Shoal light-vessel, Nantucket Sound, Massachusetts.—Light-vessel No. 6 withdrawn from its station for repairs and replaced by relief light-vessel No. 9, December 14, 1898; light-vessel No. 6 replaced on station and relief light-vessel No. 9 withdrawn January 8, 1899.

Obstruction gas buoy, New York Upper Bay, New York.—A gas-lighted buoy established December 17; discontinued December 31, 1898.

Dame Point Dredged Cut post light, No. 14, St. Johns River, Florida.—Structure carried away and light extinguished December 17, 1898; light reestablished January 14, 1899; structure again carried away and light extinguished January 20; light reestablished February 14, 1899.

Middle Ground light, Mobile Bay, Alabama.—Structure taken down and temporary light shown December 17, 1898; light reestablished June 31, 1899.

Bloody Point Bar light-station, Chesapeake Bay, Maryland.—Fog bell machinery disabled December 21, 1898; striking of bell resumed January 16, 1899.

Southwest end of Middle Ground bell buoy, Pensacola entrance, Florida.—Found adrift and replaced on its station December 22, 1898.

Trinity Shoal whistling buoy, Gulf coast of Louisiana.—Found in a sinking condition December 24, 1898; replaced by another whistling buoy June 17, 1899, the station having in the meantime been marked by a second-class can buoy.

Cedar Creek post light, No. 17, St. Johns River, Florida.—Structure carried away and light extinguished December 27, 1898; light reestablished January 14, 1899.

Halfway Rock whistling buoy, Casco Bay, Maine.—Buoy not sounding December 31, 1898; replaced by another buoy January 5, 1899.

Wolf Trap light-station, Chesapeake Bay, Virginia.—Fog trumpet disabled and bell sounded by hand December 31, 1898; trumpet repaired and bell discontinued January 16, 1899.

Robinson Point post-light station, Puget Sound, Washington.—Sounding of fog-signal discontinued for repairs January 1 to January 10, 1899.

Diamond Shoal light-vessel, seacoast of North Carolina.—Broke adrift January 8; replaced on station January 11, 1899.

Handkerchief light-vessel, Nantucket Sound, Massachusetts.—Light-vessel No. 4 withdrawn from station for repairs and replaced by relief light-vessel No. 9 January 9; light-vessel No. 4 replaced on station and relief light vessel No. 9 withdrawn February 2, 1899.

Point Hueneme light-station, seacoast of California.—Characteristic of light changed January 10, 1899.

Rodman Point Shoal light-station, Pamlico River, North Carolina.—Structure carried away by passing vessel and light extinguished January 17; structure rebuilt and light reestablished February 23, 1899.

Gowanus Flats experimental bell buoy, New York Upper Bay, New York.—Established January 20; discontinued February 1, 1899.

Dame Point Dredged Cut post light No. 16, St. Johns River, Florida.—Structure carried away by passing vessel and light extinguished January 24; rebuilt and light reestablished February 14, 1899.

Alligator River beacon light, Albemarle Sound, North Carolina.—Light extinguished January 28, 1899, owing to breaking of illuminating apparatus by wild fowl.

Port Pontchartrain light-station, Lake Pontchartrain, Louisiana.—Characteristic changed from February 1 to March 4, 1899.

Fannie Flint Wreck gas buoy, entrance to Nantucket Sound, Massachusetts.—Established February 2; discontinued June 2, 1899.

Humboldt Bay Outside Bar bell buoy, seacoast of California.—Not sounding February 6; put in working order March 28, 1899.

Off Point Buchon whistling buoy, seacoast of California.—Not sounding February 10; put in working order May 19, 1899.

Browns Head light-station, Fox Islands Thorofare, Maine.—Light discontinued February 11 on account of ice and relighted March 1, 1899.

Overfalls light-vessel No. 46, entrance to Delaware Bay, Delaware.—Carried to sea by ice February 11; replaced on station March 14, 1899.

Nantucket Shoals light-vessel, seacoast of Massachusetts.—Light-vessel No. 66 broke adrift from her station February 13; replaced by relief light-vessel No. 58 February 17; light-vessel No. 66 replaced on her station and relief light-vessel No. 58 withdrawn February 26; light-vessel No. 66 withdrawn March 5 and replaced by relief light-vessel No. 58; light-vessel No. 66 replaced on station and relief light-vessel No. 58 withdrawn May 1, 1899.

Shovelful Shoal light-vessel No. 3, Nantucket Sound, Massachusetts.—Dragged from her moorings February 13; replaced on station February 15, 1899.

South Brother Island Ledge post light, East River, New York.—Structure carried away by ice and light extinguished February 13; rebuilt and light reestablished June 17, 1899.

Lawrence Point Ledge post light, East River, New York.—Structure carried away by ice and light extinguished February 13, 1899.

NOTE.—Rebuilt and light reestablished July 17, 1899.

Cape Charles City Harbor (southern) light, Chesapeake Bay, Virginia.—Carried away by ice and light extinguished February 14; rebuilt and light reestablished.

Purtan Island post light, No. 4, York River, Virginia.—Structure carried away by ice and light extinguished February 14; rebuilt and light reestablished March 22, 1899.

Wilkinson Point Shoal beacon light, Neuse River, North Carolina.—Structure carried away by ice and light extinguished February 14; rebuilt and light reestablished April 22, 1899.

Pumpkin Island light-station, Eggemoggin Reach, Maine.—Light discontinued February 15 to February 24, 1899, on account of running ice.

Potopotank Creek post light, No. 6, York River, Virginia.—Structure carried away by ice and light extinguished February 15; rebuilt and light reestablished March 22, 1899.

Duxbury Reef whistling buoy, entrance to San Francisco Harbor, California.—Disabled February 15; replaced by another buoy February 17, 1899.

Pollock Rip Slough gas buoy, entrance to Nantucket Sound, Massachusetts.—Carried away by ice February 16; replaced on station March 27, 1899.

Grassy Island Ledge beacon light, Woods Hole Harbor, Massachusetts.—Discontinued on account of ice February 18; relighted March 2, 1899.

Middle Ledge beacon light, Woods Hole Harbor, Massachusetts.—Light discontinued on account of ice February 18; relighted March 2, 1899.

Bush Bluff light-vessel, Elizabeth River, Virginia.—Dragged out of position by ice February 18, 1899, and replaced.

Skagit River Channel post light, Washington.—Structure carried away by ice and light extinguished February 20; rebuilt and light reestablished April 29, 1899.

Cornfield Point light-vessel No. 48, Long Island Sound, Connecticut.—Dragged from her moorings by ice February 21; replaced on her station February 24, 1899.

San Luis Obispo bell buoy, seacoast of California.—Not sounding February 22; put in working order March 19, 1899.

Bartlett Reef light-vessel No. 13, Long Island Sound, Connecticut.—Dragged from her moorings by ice; was replaced on her station February 24, 1899.

Rockhall Creek beacon lights Nos. 1 and 3, Chesapeake Bay, Maryland.—Structures carried away by ice and lights extinguished February 26; rebuilt and lights reestablished April 29 and May 1, 1899, respectively.

United States Dike beacon light No. 1, Shrewsbury River, New Jersey.—Structure carried away by ice and light extinguished March 1; rebuilt and light reestablished June 1, 1899.

Lower Rocky Point beacon light No. 2, Shrewsbury River, New Jersey.—Structure carried away by ice March 1; rebuilt and light reestablished June 27, 1899.

Little Silver beacon light No. 9, Shrewsbury River, New Jersey.—Structure carried away by ice March 1; rebuilt and light reestablished June 27, 1899.

Plantation Creek range (rear) beacon light, St. Simon Sound, Georgia.—Structure destroyed by fire and light extinguished March 1, 1899; rebuilt and light reestablished.

Inner gas buoy, Galveston Harbor, Texas.—Light extinguished March 4; relighted July 1, 1899.

Henlopen Shoal bell buoy, entrance to Delaware Bay, Delaware.—Carried away by ice; replaced on station March 6, 1899.

Cape Charles light-vessel No. 49, seacoast of Virginia.—Carried from her moorings March 9; replaced on station March 17. Withdrawn for repairs and replaced by relief light-vessel No. 16 April 15; replaced on station and relief light-vessel withdrawn July 2, 1899.

Mobile Ship Channel light No. 7, Mobile Bay, Alabama.—Structure taken down and temporary light shown March 14; structure rebuilt and permanent light established June 21, 1899.

Fort Point light station, Penobscot River, Maine.—Fog bell disabled, March 15; put in working order March 17, 1899.

Long Beach bar light-station, Gardiners Bay, New York.—Fog-bell machinery disabled March 18; sounding of bell resumed June 23, 1899.

Bordentown post light, Delaware River, New Jersey.—Structure carried away by landslide March 24, 1899. Rebuilt and light reestablished.

Southwest Spit and Chapel Hill Range Cut electric buoys, New York Lower Bay, New York.—Lights extinguished March 27; relighted April 4, 1899.

Great Round Shoal whistling buoy, entrance to Nantucket Sound, Massachusetts.—Found missing and replaced by another buoy March 28, 1899.

Cleveland West Breakwater (E. end) light-station, Lake Erie, Ohio.—Fog bell substituted for steam whistle, March 29 to June 1, 1899.

Cross Rip light-vessel, Nantucket Sound, Massachusetts.—Light-vessel No. 5 withdrawn from her station for repairs and replaced by relief light-vessel No. 9, April 4; light-vessel No. 5 replaced on station and relief light-vessel No. 9 withdrawn, May 11, 1899.

Chatham Bar whistling buoy, seacoast of Massachusetts.—Found adrift and replaced by another buoy April 12, 1899.

Tail Point Pile Cluster beacon light, Green Bay, Wisconsin.—Structure carried away by ice April 20, and light reestablished in May, 1899.

Elbow beacon light, Fox River, Wisconsin.—Structure carried away by ice and light extinguished April 20; structure rebuilt and light reestablished in May, 1899.

Wreck light, Baltimore Harbor, Maryland.—A lantern light established April 29; discontinued May 1, 1899.

Off Point Pinos whistling buoy, Monterey Bay, California.—Disappeared May 1; replaced on station May 3, 1899.

Maumee Straight Channel Inner gas buoy, No. 30, Maumee Bay, Ohio.—Discontinued for repairs May 2, 1899.

NOTE.—Replaced July 25, 1899.

Frying Pan Shoals light-vessel, off Cape Fear, North Carolina.—Light-vessel No. 1 withdrawn from station for repairs and replaced by relief light-vessel No. 29, May 3; light vessel No. 1 replaced on station and relief light-vessel No. 29 withdrawn June 26, 1899.

Brazos River Jetty light, entrance to Brazos River, Texas.—Illuminating apparatus destroyed by accident May 5; temporary light exhibited May 6; light not exhibited May 26 and 27, 1899, owing to impossibility to reach it on account of storm.

Columbia River light-vessel, off mouth of Columbia River, Oregon.—Withdrawn from her station for repairs and station marked by buoy, May 6; light-vessel returned to her station and buoy withdrawn, May 13, 1899.

Boston light-vessel, entrance to Boston Harbor, Massachusetts.—Light-vessel No. 54 withdrawn from her station for repairs and replaced by relief light-vessel No. 58 May 10; light-vessel No. 54 returned to her station and relief light-vessel No. 58 withdrawn May 25, 1899.

Shovelful Shoal light-vessel, Nantucket Sound, Massachusetts.—Light-vessel No. 3 withdrawn from her station for repairs and replaced by relief light-vessel No. 9 May 11, 1899.

NOTE.—Light-vessel No. 3 returned to station and relief light-vessel No. 9 withdrawn July 9, 1899.

Old West End Pier bell buoy, Coney Island Channel, New York.—Damaged by collision and withdrawn from its station May 13; replaced on station June 9, 1899.

Lower Narrows gas buoy, No. 2, St. Lawrence River, New York.—Withdrawn from station for repairs May 13; replaced June 12, 1899.

San Francisco light-vessel, entrance to San Francisco Harbor, California.—Broke adrift in gale of May 14; replaced on her station May 16, 1899.

Sandy Hook light-vessel, entrance to New York Harbor, New York.—Light-vessel No. 51 withdrawn from station for repairs and replaced by relief light-vessel No. 11 May 17, 1899.

Humboldt beacon light No. 1, entrance to Humboldt Bay, California.—Structure carried away and light extinguished by a steamer May 17; structure rebuilt and light reestablished June 3, 1899.

East Bank gas buoy, No. 4, entrance to New York Harbor, New York.—Withdrawn from its station for repairs May 18; replaced on station June 14, 1899.

Bartlett Reef light-vessel, Long Island Sound, Connecticut.—Light-vessel No. 13 withdrawn from her station for repairs and replaced by relief light vessel No. 20 May 31; light-vessel No. 13 replaced on station and relief light-vessel No. 20 withdrawn June 20, 1899.

Apalachicola Bay range (front) beacon light, Apalachicola Bay, Florida.—Structure destroyed by fire and light extinguished, June 3, 1899.

Enterprise beacon light No. 2, Wadmelaw River, South Carolina.—Structure carried away and light extinguished by a passing raft June 4, 1899.

Halfway Rock light-station, seacoast of Maine.—Fog-signal disabled June 9; put in working order June 13, 1899.

Kitts Rock bell buoy, Portsmouth Harbor, New Hampshire.—Not sounding June 9; replaced by new buoy June 10, 1899.

Portage range (front) light, mouth of Portage River, Michigan.—Structure blown down and temporary light exhibited June 13, 1899.

Light No. 0, Portage River, Michigan.—Structure blown down and temporary light exhibited June 13, 1899.

Mount Desert light-station, seacoast of Maine.—Fog-signal disabled June 19; put in working order June 23, 1899.

Cornfield Point light-vessel, Long Island Sound, Connecticut.—Light-vessel No. 48 withdrawn from station for repairs and replaced by relief light-vessel No. 20 June 21, 1899.

NOTE.—Light-vessel No. 48 returned to station and relief light-vessel No. 20 withdrawn July 15, 1899.

Aids to navigation maintained by the Light-House Board June 30, 1899.

Aids.	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic coast.	Pacific coast.	Lake coast.	Western rivers.	Total entire coast, 1898.	Total entire coast, 1899.	Increase or decrease, 1899.
Electric lights	....	3	2	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	5	....
First-order lights	2	4	5	5	7	7	8	2	....	....	....	9	9	....	....	....	40	18	....	....	58	58	....
Second-order lights	7	3	1	....	....	1	....	3	1	....	2	1	....	....	....	....	15	1	3	....	19	19	....
Third-order lights	5	1	4	3	....	4	6	6	9	6	9	3	2	....	....	....	29	5	24	....	58	58	....
Three-and-a-half-order lights	....	2	....	....	....	....	1	....	3	1	4	....	....	....	....	....	3	....	8	....	11	11	....
Fourth-order lights	20	23	41	13	44	5	6	13	34	24	36	10	8	....	....	....	165	18	94	....	275	277	+2
Fifth-order lights	26	16	19	8	24	4	1	14	14	9	16	5	2	....	....	....	112	7	39	....	155	158	+3
Sixth-order lights	1	5	32	2	8	5	1	2	20	18	13	....	....	....	....	....	56	....	51	....	110	107	−3
Lens lanterns	7	1	5	9	23	16	15	20	12	20	50	6	13	....	....	....	96	19	82	....	189	197	+8
Range lenses	....	....	6	8	2	....	....	....	....	....	....	....	....	....	....	....	16	....	....	....	16	16	....
Reflectors	2	11	....	8	4	18	....	2	1	2	....	....	....	....	....	....	45	....	3	....	53	48	−5
Tubular and other lanterns	4	9	145	11	27	134	21	86	18	....	92	11	103	543	508	358	387	114	110	1,409	2,013	2,020	+7
Light vessels in position	....	10	8	5	3	3	....	2	4	4	3	1	2	....	....	....	31	3	11	....	44	45	+1
Electric-lighted buoys	....	....	11	....	....	....	....	....	....	....	....	....	....	....	....	....	11	....	....	....	11	11	....
Gas-lighted buoys	....	7	12	2	3	....	....	4	9	20	10	....	....	....	....	....	28	....	39	....	55	67	+12
Total lighted aids	74	95	291	74	145	197	59	104	125	104	235	46	189	543	508	358	1,039	185	464	1,409	3,072	3,097	+25
Fog signals operated by steam, hot air, or other engines	13	12	22	7	4	2	....	1	31	8	30	16	14	....	....	....	61	30	69	....	158	160	+2
Fog signals operated by clockwork	27	10	57	7	67	3	....	15	7	6	5	8	5	....	....	....	186	13	18	....	209	217	+8
Day beacons	106	75	47	3	10	40	59	28	....	....	1	55	46	5	....	....	368	101	1	5	439	475	+36
Whistling buoys	14	11	5	3	1	7	3	5	....	....	....	14	7	....	....	....	49	21	....	....	70	70	....
Bell buoys	20	20	30	6	2	12	5	3	....	....	3	11	5	....	....	....	98	16	3	....	116	117	+1
Other buoys	683	538	564	141	1,131	293	289	120	102	134	376	69	272	....	....	....	3,759	341	612	....	4,707	4,712	+5
Total unlighted aids	863	666	725	167	1,215	357	356	172	140	148	415	173	349	5	....	....	4,521	522	703	5	5,699	5,751	+52
Total number of aids	937	761	1,016	241	1,360	554	415	276	265	252	650	219	488	548	508	358	5,560	707	1,167	1,414	8,771	8,848	+77

Appropriations made at the third session of the Fifty-fifth Congress for the Light-House Establishment (act of March 3, 1899).

Supplies of light-houses	$450,000
Repairs of light-houses	625,000
Salaries of light-keepers	740,000
Expenses of light-vessels	400,000
Expenses of buoyage	550,000
Expenses of fog-signals	130,000
Lighting of rivers	300,000
Survey of light-house sites	1,000
Oil houses for light-stations	5,000

SPECIAL WORKS.

First district.

Whitehead light-station, Maine	$3,400
Cape Elizabeth, Maine, light-vessel	70,000

Second district.

Pollock Rip Shoals light-station, Massachusetts	80,000

Third district.

Hog Island Shoal light-station, Rhode Island	35,000
Greens Ledge light-station, Connecticut	60,000
Norwalk Harbor lighted beacons, Connecticut	600
Orient Point light-station, New York	3,000
Tender for the engineer Third light-house district	85,000
Staten Island light-house depot, New York	25,000

Fourth district.

Salem Creek light-station, New Jersey	4,000

Fifth district.

Hooper Island light-station, Maryland	30,000
Repairs to light-vessel No. 71 (authority)	15,000

Sixth district.

Bloody Point Range, South Carolina	2,700
Depot for the Sixth light-house district	35,000

Eighth district.

Depot at or near Mobile, Ala	12,000

Ninth district.

Tender for the inspector Ninth light-house district	85,000

Tenth district.

Depot for the Tenth light-house district	50,000

Twelfth district.

Point Arguello light-station, California	35,000
Point Hueneme light-station, California	2,000
Point Trinidad telephone line, California	250

Thirteenth district.

Tender for the Thirteenth light-house district	100,000

NEW WORKS AUTHORIZED.

Congress authorized, by act approved on February 15, 1893, the establishment of a number of light-stations at an aggregate cost of nearly half a million dollars, but made no appropriation at that time for their construction. Since then from time to time appropriation has been made for the erection of many of them. The following is a list of the light-stations remaining for which no appropriation has yet been made, with the maximum amount which each may cost:

Bay State Shoal lights, New York	$800
Fairport Harbor fog signal, Ohio	4,300
Lorain Harbor (Black River) fog-signal, Ohio	4,300
Sand Hills light-house, Michigan	20,000
Bayfield light and fog signal, Wisconsin	5,000
Pats (or Hat) Point light and fog-signal, Minnesota	15,000
Little Gull Island light and fog-signal, Michigan	20,000
Peshtigo Shoal, Green Bay, Wisconsin	10,000
Wilson Harbor light, New York	2,500
Big Oyster Bed Shoal light and fog-signal, New Jersey	25,000
Deer Point light, Florida	1,000
New York Slough light and fog-signal, California	10,000
Willamette River, Oregon, 25 beacon lights and buoys between Salem and Portland	5,000

Congress authorized, by acts approved February 18, 20, 21, and March 3, 1899, the establishment of the following-named light-vessel and light-stations, but made no appropriations therefor:

Tail of the Horshoe light-vessel, Chesapeake Bay	
Michigan City steam fog whistle, Indiana	$5,500
Sabine Bank light and fog-signal station, Texas	50,000

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report under specified headings.

SUPPLIES OF LIGHT-HOUSES.

The appropriation for supplies of light-houses for 1893, 1894, 1895, 1896, and 1897 was $385,000 for each year. While the appropriation for 1898 was $400,000 and that for 1899 was $425,000 and that for 1900 was $450,000, the number of light-stations has been increased from 951 in 1893 to 1,199 in 1899, and it is reasonable to expect that appropriations will be made during the coming session of Congress for still other lights. To meet this increased demand for necessary supplies the Board has found it impossible, with the funds provided, to keep up its reserve stock of supplies to meet emergencies. This stock has been so heavily drawn upon that to-day there are few stores on hand. The meagerness of preceding appropriations has made it necessary for the Board to cut down the quantity of supplies furnished yearly to the light-houses to such an extent that it can go no further without danger to the lights. In spite of the severe economy used there is danger that the present lights and those which are being built can not be properly kept up without an increase of appropriation. The Board therefore estimates that $500,000 will be needed for providing supplies for light-houses during the coming fiscal year, and it recommends that an appropriation of this amount be made therefor. The increase in the price of labor and material adds largely to the cost of supplies.

REPAIRS, ETC., OF LIGHT-HOUSES.

A large annual expenditure for repairs will be needed until the older light-house stations have been brought up to the standard of modern requirements. Restoration, repair, and improvement of light-house towers and structures and of illuminating apparatus; the substitution of new for old types of lamps, and of improved methods of rotation for the old devices in the case of flashing lights are required as the old wear out or become inefficient under changed conditions. At many of the older stations the light-house structures and the auxiliary buildings for the occupation and use of the keepers are not only dilapidated but out of date, and require practical reconstruction. It was the early practice of the Light-House Board to provide for the family of the principal keeper and encourage employment of assistant keepers without families. This practice is no longer considered advisable, since keepers are best obtained by promotion of assistant keepers, and the latter should be encouraged to remain long in the service, in order to qualify themselves for the position of keeper. At some stations, where a single keeper was originally sufficient and was alone provided for, assistants have been made necessary by increase of duties, due to the introduction of fog-signals or other improvements in the station. In such cases there is crowding and discomfort for the families of the employees and a lack of the privacy and comforts of domestic life which must be provided for a desirable class of employees.

It is proposed to effect the necessary improvements in the older stations progressively, by a moderate annual expenditure, and the estimate for repairs has been made in two items, the first for ordinary repairs and maintenance, the second for the reconstruction and radical improvement of dwellings and outbuildings and the construction of auxiliary buildings, boathouses, barns, etc., which are a part of all modern stations, but have been omitted in the older stations.

SALARIES OF LIGHT-HOUSE KEEPERS.

On March 3, 1899, Congress appropriated $700,000 for salaries, fuel, rations, rent of quarters where necessary, and similar incidental expenses of not exceeding 1,400 light-house and fog-signal keepers and laborers attending other lights for the fiscal year ending June 30, 1900. The Board had asked an appropriation of $800,000 for this purpose. It is now evident that a further appropriation of at least $10,000 will be necessary to enable the Light-House Establishment to pay the expenses which will be incurred under this head for the present fiscal year. It is also evident that it will need $800,000 with which to pay the expenses under this head for the year ending June 30, 1901, and the Board therefore recommends that an appropriation of this amount be made therefor.

There are now on duty in the Light-House Establishment 1,382 light-house and fog-signal keepers and laborers attending other lights. There are 37 light-houses now in process of construction, which it is expected will be finished and ready for lighting during the current fiscal year. This leaves a margin of but 12 keepers, etc., to man 37 light-houses, whereas at least 75 will be needed for that purpose. It is reasonable to suppose that Congress will make appropriations for at least 25 of the additional light-houses which the Board has recommended should be built, and that they will be ready to go into operation during the fiscal year, which will end on June 30, 1901. These light-houses will require at least 50 keepers more. The Board has recommended the establishment of quite a number of fog-signals at numerous existing light-stations, and it seems probable that the number will be increased at the next session of Congress. It will be necessary to employ another light-keeper at each station to which a fog-signal is added. The Board therefore estimates that 1,600 light-house and fog-signal keepers and laborers attending other lights will be needed before the conclusion of the fiscal year ending June 30, 1901, and recommendation is therefore made that Congress authorize in the appropriation act the employment of that number, if needed; otherwise the Board may find itself unable to man and put into operation light-houses or fog-signals which, under Congressional authorization, were erected and prepared for use. As before stated, the Board is restricted by the terms of the appropriation to the employment of but 1,400 light-house and fog-signal keepers and laborers attending other lights during the fiscal year ending on June 30, 1900. The number now employed in the beginning of that fiscal year is 1,382, and there are some 37 light-houses and fog-signals now under construction, which will, it is hoped, be finished one by one and be ready to go into operation, some long before and all of them within, this fiscal year, and as they will each require from one to three people to man them, provision should be made to authorize the Board to employ at least 1,500 light-house keepers, etc., within this fiscal year, otherwise the Board may find itself unable to man and put into operation the light houses and fog-signals as they are from time to time finished and made ready for use. The Board therefore recommends that the proper measures be taken to obtain legislative action early in the coming session of Congress therefor. Previous appropriations have been so small that the Board has been unable to increase the pay of light-keepers in proportion as they have gained experience and increased in value; hence the Board has been unable to retain some of its most reliable keepers or to secure proper men for the most important positions. It is deemed for the best interests of the Service to increase the pay of keepers holding the more important positions, who are in charge of the delicate optical apparatus, which has cost many thousands of dollars and which may be easily damaged, sufficiently to retain them in the Service. The average pay of light-keepers is fixed by statute at $600 per year. There are now in the service 1,382 keepers, and it would take $829,200 to pay them if they received the average pay fixed by statute. The sum asked with which to pay light-keepers, etc., for the current fiscal year can hardly be called an estimate, as it is reached by the addition of fixed and known items and is the result of close calculation; hence it is earnestly recommended that the amount asked, $800,000, be appropriated.

EXPENSES OF LIGHT-VESSELS.

Congress appropriated $400,000 to defray the expenses of light-vessels during the fiscal year to end on June 30, 1900. The appropriation will barely meet the needs of the service during that time. There are now 53 light-vessels in commission. Three light-vessels are being built. The Board has asked that appropriations be made for building six more. It costs about $6,000 a year to maintain a first-class light-vessel. The wear and tear on the older light-vessels increases with their age, and it costs more each year to keep them in repair. The hurricane of August, 1899, did much damage to light-vessels on the Atlantic coast. While the new light-vessels, when built, are fitted with all the modern improvements, the Board is fitting certain of the older light-vessels with fog-signals and like improvements to bring them up to its present standard. The cost of labor and material is largely increased since last year. The Board estimates, therefore, the expense of light-vessels for the ensuing fiscal year will be at least $450,000, and it is recommended that an appropriation of that amount be made therefor.

EXPENSES OF BUOYAGE.

The following extract from the Board's last annual report is renewed except as to the dates, which have been changed to meet the requirements of this annual report:

> Congress appropriated by the act of March 3, 1899, for expenses of buoyage, $550,000 for the year to end on June 30, 1900. This amount will all be expended for the purpose named. There are now some 5,000 buoys of all kinds in position. The buoys which were carried away or sunk at their moorings during the past year were replaced from the stock held in reserve, and that reserved stock lacks much of being fully replaced because of lack of funds. The Board will therefore need a larger appropriation than heretofore, not only to meet the immediate and increasing wants of commerce, but to bring up its stock of reserve buoys to its normal condition. The Board was unable to moor buoys at certain places for which request had been made, not because they were not needed, but because the appropriation therefor was insufficient. Funds are needed to maintain buoys after they are established. It is estimated that it will require $550,000, the same amount that was appropriated last year, for the purpose of defraying the expenses of buoyage during the coming year, and it is recommended that an appropriation of this amount be made therefor. Attention is invited to the necessity for additional buoys in Alaskan waters. The large emigration to the Klondike region and the enormous quantity of tonnage which has recently passed through the hazardous waters of the inside passages of southeastern Alaska, such as Peril Straits and Wrangell Straits, on their way to or from Taiya Inlet; the losses of vessels which have occurred for lack of proper buoys in these dangerous waters, where currents and tides are so swift and powerful, make it necessary that additional buoys should be placed. There are now but 58 buoys in Alaskan waters. The immense and growing Klondike trade by the inside and outside passages seems to make a large addition to this number imperative.
>
> The commerce which goes to Bering Sea must pass through the Aleutian Islands by the way of Unalaska Island. This passage is full of peril from hidden rocks, swift and strong currents, and dense fogs; hence it should be carefully and thoroughly buoyed. It is equally necessary that the practicable mouths of the Yukon River and the approaches to St. Michaels Island, which has the nearest harbor to the Yukon, should be kept buoyed. Therefore a large addition to the present number of buoys in Alaskan waters is required in the interests of commerce and navigation.

The increase in the price of labor and material adds largely to the expenses of buoyage.

FOG-SIGNALS.

The limited appropriation for this purpose has not permitted the general renovation and improvements that are so much needed in this important class of aids to navigation, though considerable progress has been made. Improved apparatus has been installed at several stations, preserving the system of interchangeability between the various members of the duplicate sets of apparatus required in each case. The Board is of the opinion that the change from the old-style steam engine, which consumes a great deal of steam, to the Crosby automatic engine, which operates by clockwork and consumes steam only for winding the clock and opening the valve, is desirable and should be made, at least as rapidly as the old engines become unserviceable; that the replacing of steam boilers by some form of explosive engine with an air compressor is desirable for all stations where the water supply is precarious, and may perhaps be found advantageous by experience in all cases when the present installation of steam boilers becomes unserviceable; that in view of the probability that steam will be replaced by compressed air quite generally for fog-signals, it is not desirable to enter at once upon any considerable expenditure for perfecting the installation of steam boilers.

The increased demand for this class of aids to navigation, considered in some localities of more importance than lights, and the necessity for extensive repair and renewal, demand a liberal appropriation.

LIGHTING OF RIVERS.

The appropriation of $300,000 made by the act approved March 3, 1899, was barely sufficient to maintain the post lights which had already been established, and it was insufficient to enable the Board to establish and maintain other lights, which it is evident are much needed. It is estimated that $400,000 will be needed to defray the expenses of lighting rivers during the next fiscal year, and it is recommended that an appropriation of this amount be made therefor.

NEW LIGHT-STATIONS AND DEPOTS.

Estimates for special appropriations for new light-stations and depots have been revised with particular care to bring them up to date, and make them conform to the actual needs of navigation in the various districts throughout the coasts and inland waters.

In recommending appropriations for new aids to navigation, the Board has in no instance taken the initiative, but has yielded to the persistent and well-founded demands of the interests of navigation. The Board desires to commend especially as a much needed aid to navigation, the establishment of a first-order light at Hillsboro Inlet, to complete the system of lighting on the South Atlantic coast by filling the long gap which now exists between Jupiter Inlet and Fowey Rocks.

NEW LIGHT-VESSELS.

The following recommendation which was made in the Board's last annual report is renewed:

> The Board has recommended in the proper place in the body of this report that appropriations be made for building a light-vessel for Cape Lookout Shoals, North Carolina; a relief light-vessel for both districts on the Pacific coast; two small, inexpensive light-vessels, the one for Peshtigo Reef, Green Bay, Lake Michigan, and the other for Martins Reef, Lake Huron; and a steam light-vessel with all modern improvements for use at Blunts Reef, off Cape Mendocino, on the Pacific coast. Each is much needed, but attention is especially invited to the urgent necessity for the relief light-vessel.

NEW TENDERS.

The Board has recommended that appropriations be made for building six new steam tenders. It was recommended in the Board's last two annual reports, that a steam tender be built for the use of the Inspector of the Third light-house district and one for the use of the Inspector of the Tenth light-house district. These recommendations are renewed. The tenders now in the Third district are so nearly worn out that they can only last, if used with care, until vessels can be built to take their places. The tenders now in use in the Ninth and Tenth districts are too small, too slow, and too costly to run, being old and lacking in economical modern improvements. In its last annual report the Board recommended that a tender be built for use in engineering and construction work in the First and Second light-house districts, comprising the coast of Maine, New Hampshire, and Massachusetts; another in the Seventh district, with headquarters at Mobile; another for use in engineering and construction work in the Twelfth district, with headquarters at San Francisco. These recommendations are renewed. The First and Second districts have now a tender, the Myrtle, for construction and repair, which is quite old and becoming unserviceable and must be replaced by a strong, seaworthy vessel; the Seventh district has now only a sailing vessel for construction and repair, which can not keep up with the work.

In addition to these the Board now has to renew its recommendation that a tender be built for construction and repair in the Ninth district. Since it has been found necessary to separate the Ninth and Eleventh districts on account of the increase of work to be done, the Ninth district has been without a tender for construction and repair and it was necessary to charter a steam vessel for this season's work. A chartered vessel is rarely adapted to the requirements of the service, is generally one that can not be usefully employed on private account, and the use of a vessel designed for the work and owned by the Government is far more advantageous and economical.

OIL HOUSES FOR LIGHT-STATIONS.

Under this appropriation oil houses have been completed during the year at the following-named light-stations:

First district.—Burnt Island, entrance to Boothbay Harbor, Maine.

Sixth district.—Tiger Island South Range, Florida.

Seventh district.—Northwest Passage, Florida.

Ninth district.—Kalamazoo, Michigan; Sheboygan, Wisconsin.

Tenth district.—Manhattan, Ohio; Maumee Bay Range, Ohio; Dunkirk, New York; Fairhaven, New York.

Eleventh district.—Six Mile Point Range, Hay Lake Channel, Michigan.

Twelfth district.—Alcatraz, California.

An appropriation of $15,000 is recommended for continuing the work of erecting oil houses during the fiscal year 1901; and if the amount is made available, the work of providing these houses at established stations where they are required can be brought well along toward completion. This work has been in progress for a number of years, and it would be conducive to economy to provide at once for its completion. All new stations are provided with oil houses under the special appropriation for each station, and further appropriations for oil houses will not be required after the older stations have been provided for. Oil houses are needed for such storage of oil at points remote from the light-house structures as will minimize the danger of destruction of the buildings by fire.

DEPOTS AND SHOPS.

There are now maintained a total of 36 depots in the 13 sea and lake coast districts, and appropriations were made in the sundry civil act of July 1, 1898, for establishing 2 more, one in the Ninth and one in the Eleventh district, which will soon be completed. While all these depots are available for the general purposes of the service, a considerable number of them are more especially designed for the storage, repair, and painting of buoys, and other work incident to this branch of the service. The Board has now to recommend that an additional depot be established in the Ninth district at Milwaukee, Wis. This is needed for storage of material for construction and repair, and for use of tenders.

In addition to the shops at the Staten Island depot in the Third district, known as the general light-house depot, all the districts, except the Twelfth, are now provided with machinists and shops, with an outfit of tools and machinery more or less complete, so that ordinary repairs to illuminating apparatus and fog-signal machinery may be made within the limits of the district and under the supervision of the local officers. The establishment at Staten Island is maintained as a general supply, manufacturing, and repair depot, but with the expansion of the service and the improving local facilities for purchasing and distributing supplies and making repairs, the necessity for centralizing the minor operations at a general depot is constantly growing less, and the policy is adopted of making each district independent, as far as practicable, by placing the work of supplying stations and keeping the apparatus in order in the hands of the local officers of each district. The central depot at Staten Island will still remain the depot for investigation and experiment and for the purchase and manufacture in quantity of articles of general use. Under the direction of the local officers during the past year tests of various apparatus and supplies have been made, resulting in improved specifications for illuminating oil; the definite rejection of the use of acetylene gas in its present state of development, as not economical nor advantageous for use as an illuminant by the Light-House Establishment; the characteristic painting of light-stations, to distinguish a fixed from a flashing light, and of all post lights to indicate, as in the case of buoys, the starboard and port side of the channel; improved methods of rotation of flashing lights by the use of ball bearings, which permit increased speed with less friction, and so require less power to shorten the intervals between flashes; the simplification and improvement of the Crosby automatic engine for opening the valves of fog-signals and determining their characteristics; the introduction of the blower siren in localities where a bell would otherwise be used with less advantage, the device being simple, economical, and depending for the production of sound upon a large volume of air at low pressure, as ordinarily delivered from the blower; and the rejection for the present, until further development, of any device for producing an incandescent light by burning oil as a fuel.

In the light of past experience, the Light-House Board is satisfied that kerosene oil of good quality, burned in suitable lamps, is better adapted as an illuminant to the general use of the Light-House Establishment than anything else that has been brought to its attention.

Among the various reports of the local officers of the Third district the Board selects as a part of its own that of the Engineer of the Third light-house district, Lieut. Col. D. P. Heap, United States Army, upon the methods of revolving the optical apparatus of light-houses.

METHODS OF REVOLVING THE OPTICAL APPARATUS FOR LIGHT-HOUSES.

Whenever a stretch of coast is to be lighted, it is necessary to differentiate the lights from one another so that the mariner may know positively where the lights visible to him are located so that he may be able to properly lay his course.

To do this various methods are possible; one by giving different colors to the lights, and another by some arrangement which will make the light invisible at determined intervals.

The former method is accomplished by interposing red, or in some rare instances green, glass screens in front of the light. It is objectionable, as the loss of light is respectively 75 and 80 per cent, and especially when green glass is used, the color, under some conditions, is difficult to distinguish from the ordinary light.

In the second method the light can be eclipsed by interposing an opaque screen moved at regular intervals by clockwork during the obscuration. The light, of course, is lost, but this method has the advantage of economy and can be applied to any existing fixed light without affecting its range of visibility. A number of lights in Delaware Bay are so arranged. (See Appendix, Annual Report of Light-House Board, 1892.)

The method which gives the most powerful light is to use an optical apparatus which will project a number of horizontal beams of light like the spokes of a wheel and then to revolve the apparatus.

It is evident that the observer, wherever situated, will see as many flashes during one revolution of the apparatus as there are beams of light, and that these flashes will be separated by intervals of darkness. It is also evident that the power of these beams will vary inversely as their number. For example, if there are but two beams, each beam will be twice as powerful as if there were four; on the other hand, if the speed of revolution of the apparatus in each case is the same, the interval between flashes with two beams will be twice as great as if four were used, which is a serious defect when the speed of revolution is slow, as the mariner may have to wait one or even two minutes before he sees the flash, which is now the case in a number of the light-houses in this country, as will be seen from the following list:

FIRST DISTRICT.

Baker Island.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Tennant Harbor.—Fifth order, fixed red, varied by a red flash every minute.

Monhegan Island.—Second order, flashing white every minute.

Franklin Island.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Halfway Rock.—Third order, fixed white, varied by a red flash every ninety seconds.

Cape Elizabeth.—Second order, fixed white, varied by a white flash every minute.

Wood Island.—Fourth order, fixed red, varied by a red flash every minute.

Whaleback.—Fourth order, fixed white, varied by a white flash every ninety seconds.

SECOND DISTRICT.

Ipswich.—Fifth order, fixed white, varied by a white flash every ninety seconds.

Race Point.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Bird Island.—Fifth order, fixed white, varied by a white flash every eighty seconds.

THIRD DISTRICT.

Montauk Point.—First order, fixed white, varied by a white flash every two minutes.

Falkner Island.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Norwalk Islands.—Fourth order, fixed white, varied by a red flash every minute.

FOURTH DISTRICT.

Tucker Beach.—Fourth order, fixed white for one minute, followed by 6 red flashes with intervals of ten seconds.

FIFTH DISTRICT.

Thimble Shoal.—Fourth order, fixed white for one minute, followed by 6 flashes alternate red and white with intervals of ten seconds.

Watts Island.—Fifth order, fixed white, varied by a white flash every two minutes.

Cove Point.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Currituck Beach.—First order, fixed white, varied by a red flash every ninety seconds.

Northwest Point Royal Shoal.—Fourth order, fixed white, varied by a white flash every ninety seconds.

SIXTH DISTRICT.

Cape Romain.—First order, flashing white every minute.

Amelia Island.—Third order, flashing white every ninety seconds.

Cape Canaveral.—First order, flashing white every minute.

Jupiter Inlet.—First order, fixed white, varied by a white flash every ninety seconds.

SEVENTH DISTRICT.

Sand Key.—First order, fixed white for one minute, varied in next minute by a white flash of ten seconds' duration, preceded and followed by partial eclipses of twenty-five seconds.

Sanibel Island.—Third order, fixed white, varied by a white flash every two minutes.

Cedar Keys.—Fourth order, fixed white, varied by a white flash every minute.

Pensacola.—First order, flashing white every minute.

EIGHTH DISTRICT.

Horn Island.—Fourth order, fixed white, varied by a red flash every minute.

Cat Island.—Fifth order, fixed white, varied by a white flash every ninety seconds.

Port Pontchartrain.—Fifth order, fixed white, varied by a white flash every ninety seconds.

Sabine Pass.—Third order, fixed white, varied by a white flash every ninety seconds.

Matagorda.—Third order, flashing white every ninety seconds.

Point Isabel.—Third order, fixed white, varied by a white flash every minute.

NINTH DISTRICT.

Waugoshance.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Beaver Island.—Fourth order, fixed white, varied by a white flash every minute.

South Fox Island.—Fourth order, fixed red, varied by a red flash every two minutes.

Point Betsey.—Fourth order, fixed white, varied by a white flash every ninety seconds.

White River.—Fourth order, fixed white, varied by a red flash every minute.

Grand Haven.—Fourth order, fixed white, varied by a white flash every ninety seconds.

St. Joseph.—Fourth order, fixed white, varied by a white flash every ninety seconds.

TENTH DISTRICT.

Stony Point.—Fifth order, fixed white, varied by a white flash every two minutes.

Big Sodus.—Fourth order, fixed white, varied by a white flash every two minutes.

Thirty-Mile Point.—Third order, flashing white every ninety seconds.

Horseshoe Reef.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Dunkirk.—Third order, fixed white, varied by a white flash every ninety seconds.

Ashtabula (front).—Fifth order, fixed white, varied by a white flash every two minutes.

Green Island.—Fourth order, fixed white, varied by a red flash every minute.

Detroit River (*Bar Point*).—Fourth order, fixed white for one minute, followed during the next minute by six consecutive white flashes at intervals of ten seconds.

Grassy Island.—Fifth order, fixed white, varied by a white flash every minute.

ELEVENTH DISTRICT.

Fort Gratiot.—Third order, fixed white, varied by a white flash every two minutes.

Port Austin Reef.—Fourth order, fixed white for one minute, followed during the next minute by five consecutive red flashes at intervals of twelve seconds.

Thunder Bay.—Fourth order, flashing white every ninety seconds.

Cheboygan.—Fifth order, fixed white, varied by a white flash every ninety seconds.

Grand Island.—Fourth order, fixed white, varied by a white flash every ninety seconds.

Granite Island.—Fourth order, fixed white, varied by a red flash every ninety seconds.

Portage River.—Fifth order, fixed white, varied by a red flash every minute.

Manitou.—Third order, fixed white, varied by a white flash every minute.

Eagle Harbor.—Fourth order, fixed white, varied by a white flash every two minutes.

Outer Island.—Third order, flashing white every ninety seconds.

Raspberry Island.—Fifth order, fixed white, varied by a white flash every ninety seconds.

TWELFTH DISTRICT.

Trinidad Head.—Fourth order, fixed white, varied by a red flash every minute.

Crescent City.—Fourth order, fixed white, varied by a white flash every ninety seconds.

THIRTEENTH DISTRICT.

Cape Arago.—Fourth order, fixed white, varied by a white flash every two minutes.

Heceta Head.—First order, flashing white every minute.

Cape Meares.—First order, fixed white, varied by a red flash every minute.

Willapa Bay.—Fourth order, fixed white, varied by a white flash every two minutes.

Before the invention of the Fresnel lens, metallic reflectors were used. Mr. Thomas Stevenson describes a revolving light of this character in Light-House Illumination, published in 1859. The following is an extract:

"The characteristic requirements of a revolving light are the alternation of light and darkness in every azimuth. In the catoptric system this is generally effected by means of a revolving frame on which the reflectors are placed, each having its own lamp attached to it. Whenever, by the revolution of the frame, the axes of the reflectors are pointed to the eye of a distant observer, he receives the full effect of the light. From this description it is obvious that if the revolving frame has four, six, or eight faces, with one or more reflectors on each as shown in plan and elevation, figs. 1 and 2, there will be constantly illuminated four, six, or eight corresponding portions of the horizon; and as the frame that supports the reflectors which produce their corresponding beams of light revolves on its axis through 360 degrees, the luminous patches will, in like manner, traverse along the distant horizon. The action of the optical agents in this instance must obviously differ from that required for fixed lights. In the fixed light we have seen that the bending of the diverged rays, so as to become parallel to each other, is confined to the vertical plane, whereas in the revolving light the action by which the diverging rays are rendered parallel, is quaquaversal, or is exerted in every possible plane, including the horizontal and the vertical, so that (supposing the flame to be no more than a mathematical luminous point) while the fixed apparatus would give only a vertical sheet of light having no breadth, and having a height equal to the height of the apparatus, the revolving light would give a solid beam of parallel rays having a height equal to the height of the apparatus, and a breadth equal to its breadth."

In this case the framework carrying the lights revolves around a central shaft, the power being applied by means of a bevel gear at *m*.

With the advent of the Fresnel lens now in use a special support became necessary. The first was known as the chariot and it is still largely in use. It consists of a steel ring supporting a number of wheels. The base plate of the lens rests on these wheels which, in their turn, run on a steel track on top of the pedestal. (See fig. 3.) Other wheels with vertical axes are in contact with the vertical collar and prevent lateral motion. This device answers well enough where slow speed is required, but there is too much friction developed when the speed is greater than one revolution per minute, especially with the heavy apparatus of the higher orders; besides, the chariot wheels are expensive to manufacture and the track on which they run soon becomes deteriorated.

The late Brig. Gen. James C. Duane, when he was engineer of the Third light-house district, devised a pivot to support lenses of the fourth order and smaller. This pivot, which was of hardened steel, rested on a hardened steel plate, both submerged in oil. This materially reduced the friction, but the lateral motion had to be prevented by a shaft running in a brass collar, and there was considerable friction between the collar and shaft. In 1893 I substituted ball bearings for the pivots, but retained the collar and shaft, and thus did not reduce the friction as much as was desirable. The necessary speed of rotation had in the meantime much increased; in fact, the speed of rotation of a "lightning light" was not infrequently one complete revolution in ten seconds. To get this speed with lenses weighing as much as 3 tons, supported on chariot wheels, was impossible without increasing the power and size of the rotating apparatus beyond reasonable limits.

The French engineers, however, solved this problem in a most satisfactory manner by supporting the lens apparatus in a bath of mercury. This allowed the use of "feux éclairs," or "lightning lights."

I quote the following from a recent pamphlet of Mr. W. T. Douglas, M. I., C. E.:

"Such was the position of affairs when the invention of Mr. Bourdelles inaugurated a revolution the full extent of which has perhaps hardly yet been realized, for the 'feux éclairs,' with its mercury float rotation, has, wherever it has been adopted, commended itself to the approval of the maritime world. It is universally admitted that, sufficient power being granted, the fixed light is, from the point of view of visibility, the light par excellence. It is kept constantly in view, and a bearing can be taken from it and a course steered to it with absolute certainty when it is once picked up. The same statement could not be made with reference to a slow revolving light; the periods of darkness are so long that the sailor is apt to lose patience, and if he happen to miss one or more flashes from any cause, as, for example, from the vessel falling into the trough of the sea, or from the obscuration of the light by masses of spray, or even possibly by a passing vessel, his nerves may become unstrung, he wavers, and a disaster may result. Now this danger and difficulty the 'feux éclairs' readily surmounts, as its lightning flash or flashes, occurring every five seconds with persistency, renders it for all practical purposes a fixed light, while it confers the further advantage of a positive characteristic.

"The following illustration will elucidate still further the nature of the changes which have taken place from fixed lights to revolving or slow-flashing lights, and from these again to the 'feux-eclairs': If a panel of revolving apparatus is set up, and a powerful light is placed at its focus, a fixed light results. Rotate the panel slowly, while the eye of the observer retains its original position, and a flash of, say, three seconds every minute will be produced; the essential feature of a revolving light of the earlier type is thus realized. Next, if the speed of the rotation be increased to give a flash of one and one-half seconds, a flashing light will result. Finally, when the rotation occurs with hitherto unprecedented rapidity, and the flash consequently is retained by the retina only for a fraction of a second—preferably for but one-tenth second—the light is identical with that given by the 'feux-eclairs' or lightning lights. If this progression from fixed to very rapid rotation of the light were watched from a distance, the increase in brilliancy as the ten-second flash was reached would be observed. It may be taken as an axiom that there is a waste of light where it is allowed to rest on the eye longer than the time necessary for complete perception, which period is one-tenth second. Light may be economized so that greater intensity shall be given to the beam emanating from the apparatus. This is the underlying principle which governs the system of illumination by 'feux-eclairs.' Elaborate experimental investigation has been made, notably by Mr. A. Charpentier, to determine the exact time which an intense ray of light falling on the retina requires for full perception. This time was set down at between eight-hundreths second and one hundred and twenty-five thousandths second. A mean between these two periods was accepted for working purposes, and the French light-house service accordingly fixed the standard duration of a flash at one-tenth second. In future, therefore, this law will determine the maximum effect of an optical apparatus, and any 'wire drawing' of the flash—if the phrase may be used—beyond these limits will mean want of economy and a diminution of the efficiency of the light."

The use of the mercury bath for rapidly revolving lenses of the first and second order seems at present to be a necessity. At least no satisfactory substitute has yet been found.

But with lenses of the third order perhaps, and certainly with fourth and fifth order lenses, there is no difficulty in revolving them at moderately fast speeds—say one revolution in twenty seconds—by supporting them on properly constructed ball bearings. This change from the old style necessitated a change in the pedestal, the clock, the method of raising the lens, and in the lamp. These changes are as follows: The pedestal, fig. 4, consists of four wrought-iron pipes covered with brass tubing for a finish. These pipes are secured to a base ring which is to be screwed to the lantern floor and support a cast-iron plate. Below this is a brass plate on which the clock rests. The pedestal must be carefully leveled.

On the cast-iron plate is a brass cylinder threaded to receive a collar, and on the cylinder is an iron plate on which the ball-bearing plates rest.

This method of construction brings the ball bearings as near as possible to the center of gravity of the lens. Another iron plate rests on the upper ball-bearing plate, and on the former the lens is supported by three diagonal braces. This plate also carries the lamp. (See fig. 5.) The clock, fig. 6, is regulated by a centrifugal governor. As the speed increases the balls fly out and draw the disk on the left-hand side of the clock to the right until this disk touches a small wooden finger, which can be moved back and forth by a screw. The farther this disk can travel the greater will be the speed of the clock. The speed can be regulated to a nicety while the clock is in motion, which is not the case when fan governors are used.

The vertical spring on the left-hand side has a brass finger which touches the disk when the clock is at rest, and by so doing makes an electric connection and rings a bell to warn the keeper that the clock has stopped. A switch is provided to open the circuit during the day.

The power to revolve the lens is applied bv a shaft engaging a crossbar in the plate under the lamp. When it is desired to disengage the lens from the clock, this shaft is drawn down and clamped. When unclamped a spring in the clock shaft forces it to its place. If it is then reclamped the clock will revolve the lens.

The ball bearings should be removed every morning, carefully cleaned, and replaced in the evening. First oil each ball with a minute drop of the best clock oil.

To remove the ball bearings the clock and lens are disengaged as mentioned above, the collar under the lens is turned to the right until it bears against the plate; the whole lens is then turned to the right until the screw threads on the collar are even with the screw threads on the central support. The lens will then be in the position shown in fig 7.

The wire handle shown lying at base of clock in fig. 6 can be secured around the groove in the lower ball-bearing plate and both plates and balls can be lifted out.

The reverse of this process allows the ball bearings to be returned to their position and the lens made ready for use.

The ball-bearing plates and the balls are of the best tool steel, hardened, tempered, and polished. The balls and grooves must be kept scrupulously clean and free from rust. When not in actual use plates should be wrapped in a greasy cloth and kept in a dust-proof box and the balls kept in a chamois skin bag. A spare set of ball bearings and a spare governor are supplied with each apparatus.

I find that there is less friction than with a mercury bath; the mercury alone for a fourth-order lens costs about $100, while the cost of the ball bearings is $15 each.

The apparatus illustrated is a Chance Brothers fourth order flashing lens, three panels having been removed and replaced by silvered spherical reflectors. It is designed to make a complete revolution in thirty seconds and will give a flash of about one-third of a second duration every ten seconds.

A similar apparatus, but with 6 panels, is in successful operation at Romer Shoal light-station. It gives a flash every four seconds. I do not think that there is any other fourth-order lens in our service with as short intervals between flashes.

The principal advantage is the speed of revolution which can be obtained by this system. Incidental advantages are the increased room in the lantern, the ease and certainty of regulating the speed while the lens is in motion, the facility with which the ball bearings can be removed and replaced, and the addition of the electric alarm to warn the keeper if the lens should stop.

The pedestal, clock, and ball bearings can be substituted for those now in use at any fourth or fifth order light at a cost of $300 each, and there are many other stations of these orders in addition to those mentioned in the list where the intervals between flashes can be reduced to advantage, and this can be done without any change in the existing lens apparatus. The changes will be confined to the pedestal, clock, and bearings.

A third-order lens at Sturgeon Bay Canal light-station is now revolved on this principle, but I do not consider that it has yet been in use long enough to have got beyond the experimental stage.

Figs. 8 and 9 show the ball bearings. I apprehend that a groove will be worn in the steel plates, owing to the small number of balls used and the consequent weight each will have to carry.

I inclose a drawing showing a modification which will be applied to the third-order apparatus for Toledo Harbor, Ohio, and Devils Island, Michigan, light-stations. (See fig. 10.)

D. P. HEAP,
Lieutenant-Colonel of Engineers, Engineer Third Light-House District.

THE CIVIL SERVICE.

The following statement, which was made in the Board's last annual report, is repeated:

> By the President's order of May 6, 1896, the Light-House Establishment was included with those departments of the public service in which appointments and promotions of employees are governed by rules and regulations prepared or approved by the Civil Service Commission. This required many changes from methods that had been in use for a long term of years, and the complete inauguration of the new system was greatly delayed by various causes. The principal difficulties arose from the peculiar nature of the Light-House Service.
>
> The light-keepers and other employees are widely scattered, many of them being stationed on light-vessels and at inaccessible localities along the coast, and rules and methods which had been found satisfactory in other departments were totally inapplicable to this service. The difficulties that were developed in putting the new system into effect were, however, overcome in a large measure by appropriate modifications of the rules, and the Board and the Civil Service Commission worked in harmony throughout. Upon recommendation of the Board, the Secretary of the Treasury, by letter of February 19, 1898, suggested that a central board be organized for the consideration of all matters of civil service of the Light-House Establishment, this board to consist of the chairman, the two secretaries, and the chief clerk of the Light-House Board. It was also recommended that a local civil-service board be created in each light-house district, each of these boards to consist of the inspector, the engineer, and the chief clerks of the inspector and engineer.
>
> These recommendations received the approval of the Civil Service Commission, and appointments were issued accordingly.
>
> The central board formulated detailed instructions for the local boards, and these were issued on May 7, 1898.
>
> The system may be said to have been in practical working order since that date.

The Board is pleased to state that it has been able to conform its practice to the rules of the Civil Service Commission, and that they appear to be working satisfactorily to all concerned.

NEWLY ACQUIRED POSSESSIONS.

The following recommendation made in the Board's last annual report is renewed:

> In view of the necessity of extending the jurisdiction of the Light-House Board over our newly acquired possessions of Porto Rico and Hawaii, the Board respect-

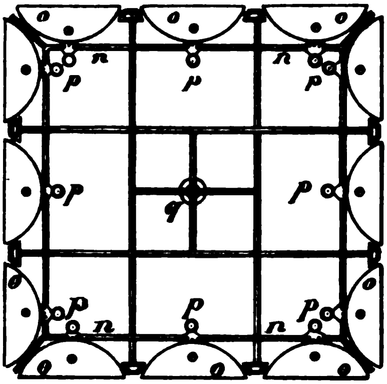

Fig. 1.

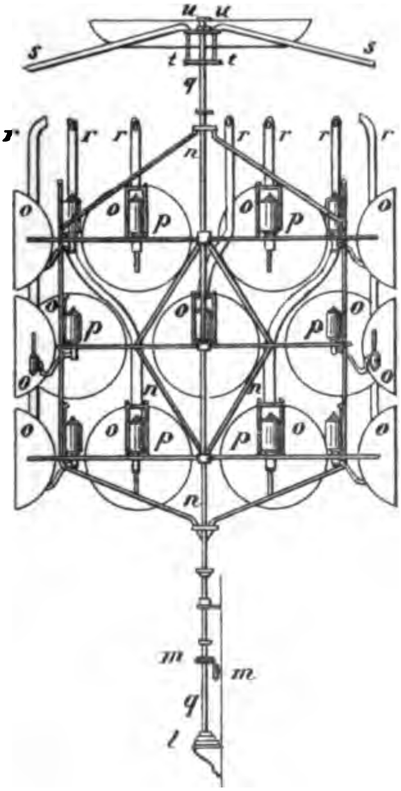

Fig. 2.

REVOLVING LIGHT

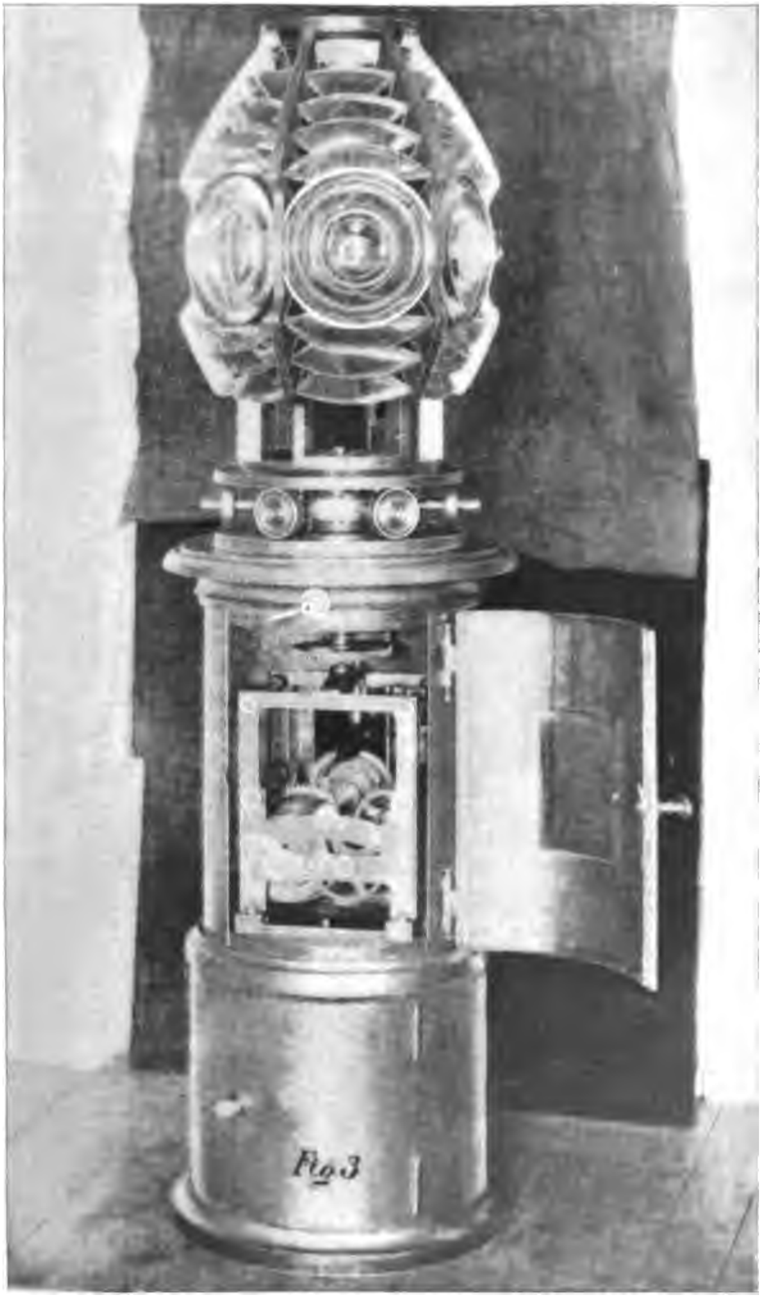

FIG. 3.— REVOLVING LIGHT.

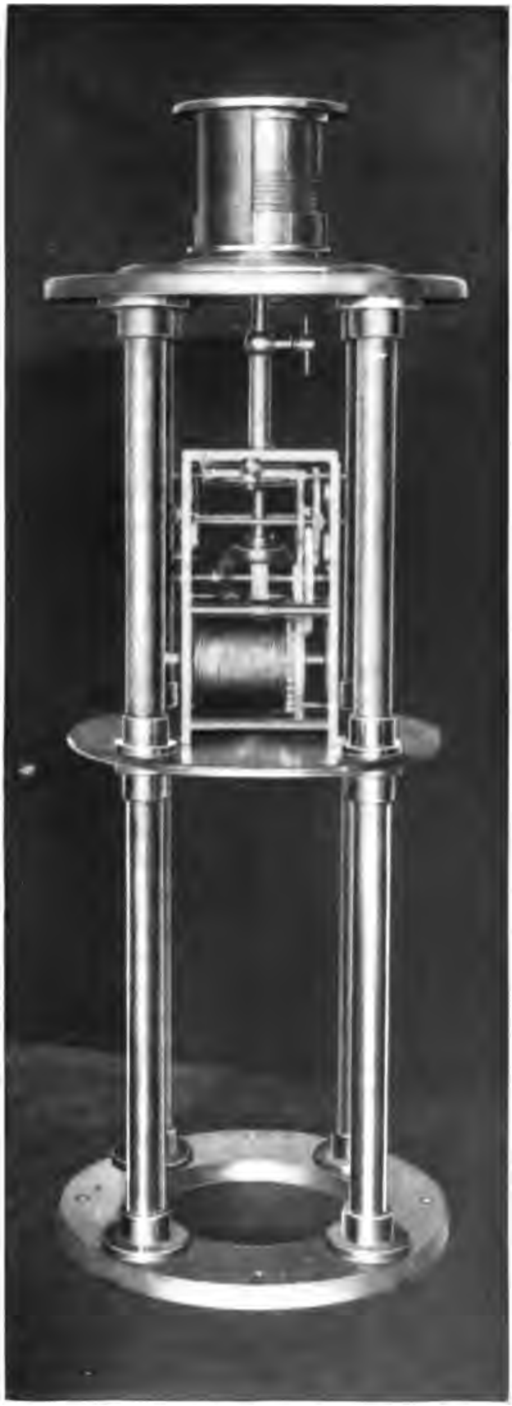

FIG. 4.—LENS PEDESTAL WITH CLOCK.

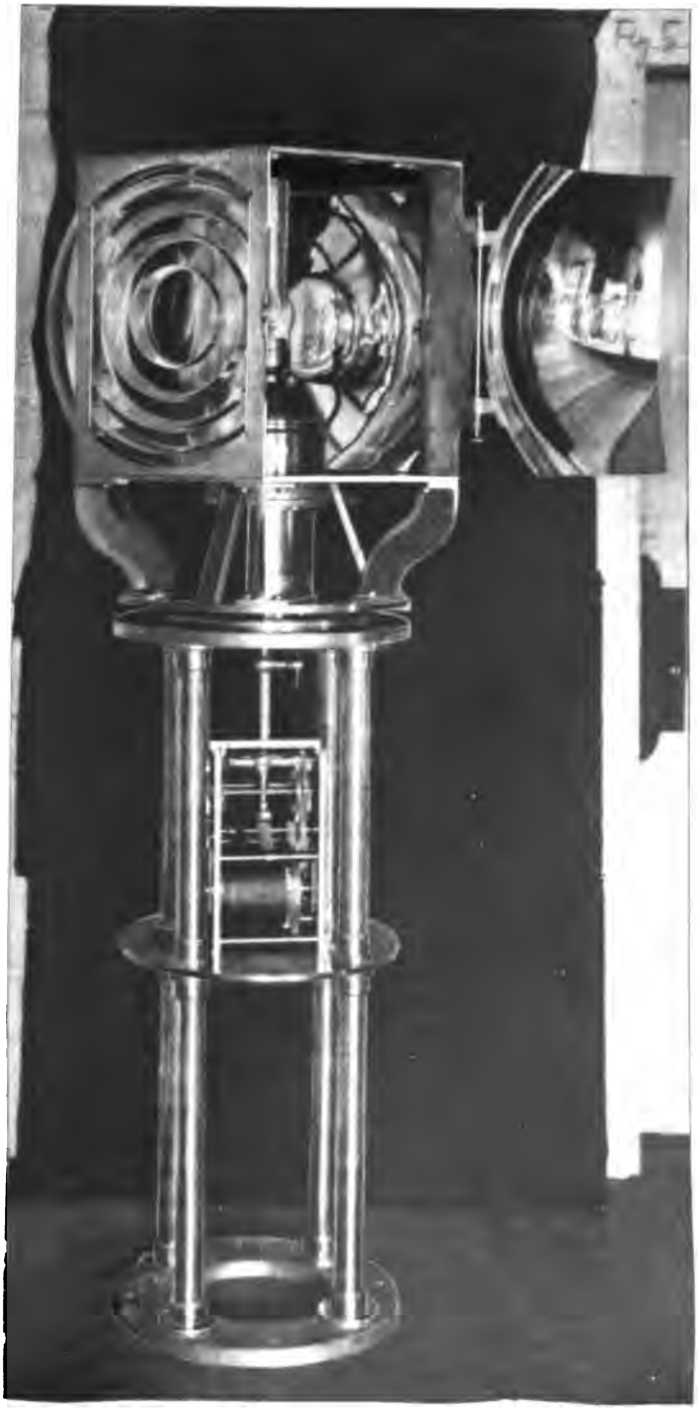

FIG. 5. - LENS AND PEDESTAL WITH BALL BEARING.

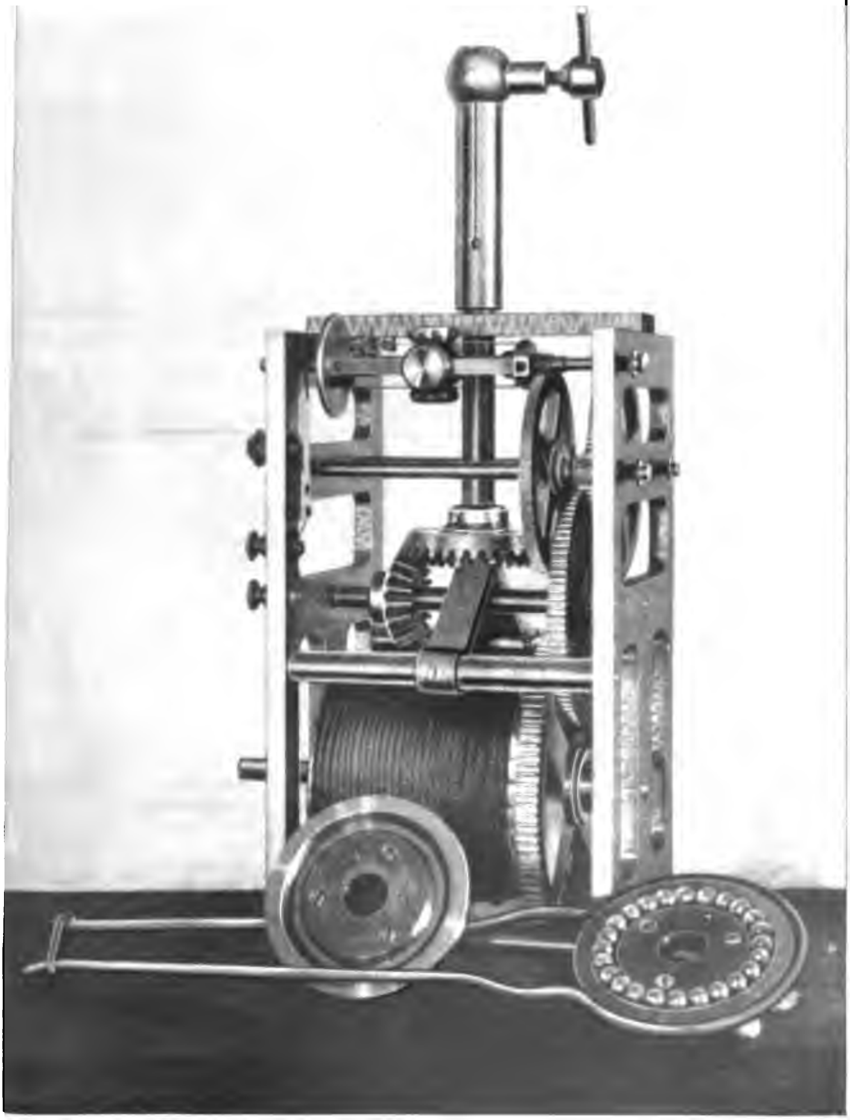

FIG. 6.—CLOCK AND BALL BEARING.

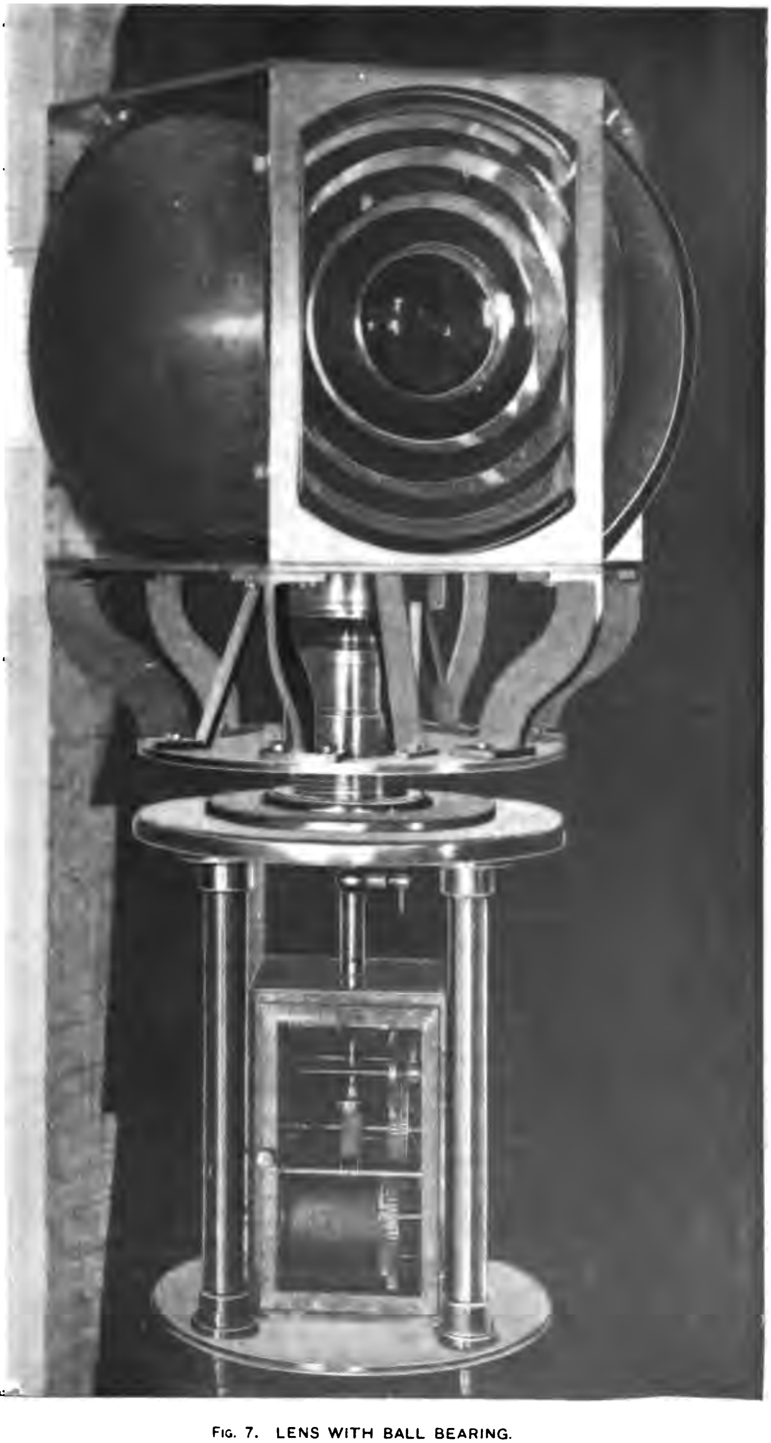

Fig. 7. LENS WITH BALL BEARING.

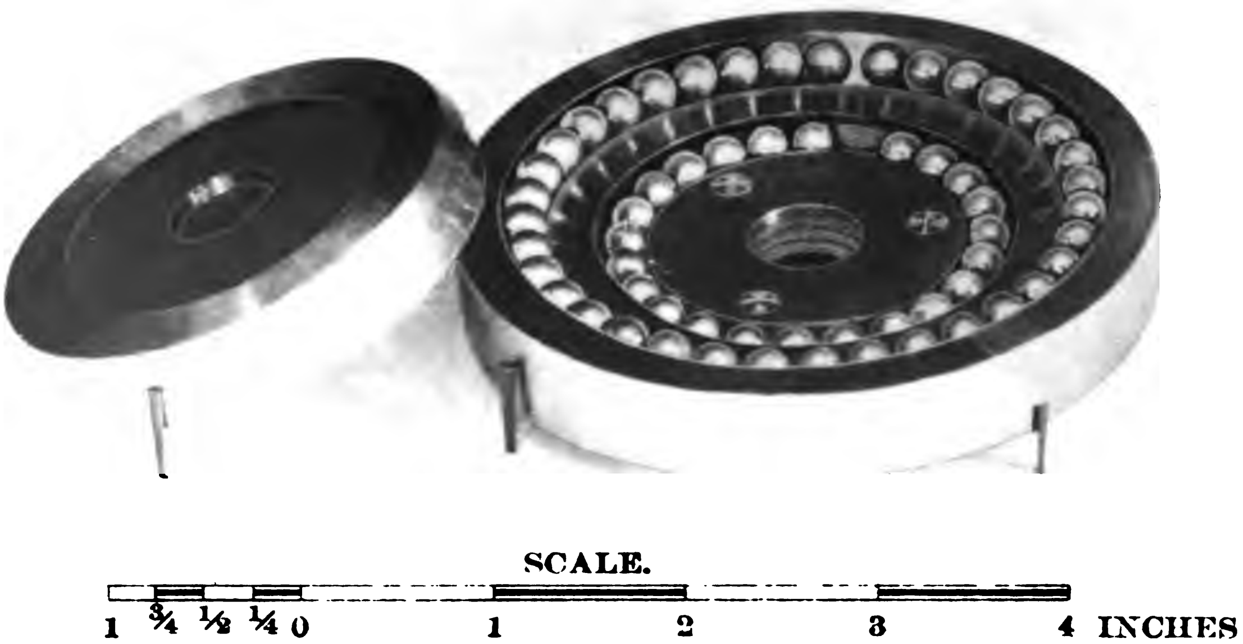

FIG. 8.—BALL BEARING FOR STURGEON BAY LENS, TOP PLATE REMOVED, SHOWING INNER ROW OF BALLS WHICH CARRY THE LENS.

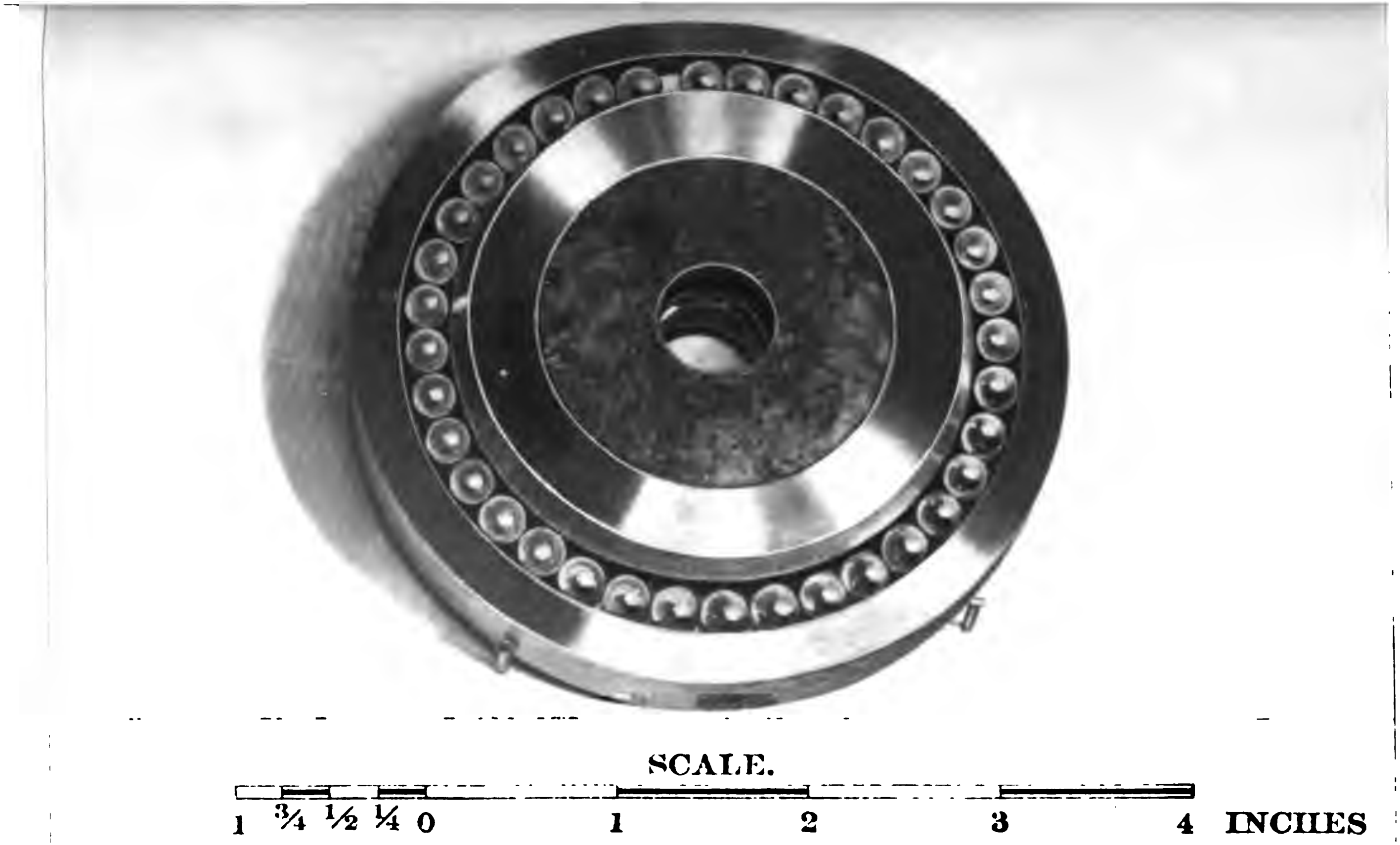

Fig. 9.—Ball bearing for Sturgeon Bay lens, top plate in position.

fully recommends that the proper steps be taken to obtain appropriate legislation to that effect that this work may be entered upon as soon as possible.

It is estimated that to maintain the Porto Rican Light-House Establishment for the coming year will cost $45,000, and that to maintain the Hawaiian Light-House Establishment for the same time will cost $25,000, and it is respectfully recommended that appropriations of these amounts be made therefor.

In view of the erection of additional lights since the Board's last annual report was issued, it is deemed proper to increase the amount estimated as needed for the maintenance of the Porto Rican lights from $45,000 to $50,000 for the next fiscal year.

ALASKAN WATERS.

Letters, petitions, and memorials have been received by the Board during the past few months from chambers of commerce of the Pacific coast, citizens, and others interested in the navigation of Alaskan waters, urgently requesting immediate action in establishing lights and fog-signals as aids to navigation in these waters, and also requesting a division of the present Thirteenth light-house district, making two districts of it.

In view of the great extent of navigable waters included in this district and of the increased traffic in this region, particularly between Puget Sound points and those along Lynn Canal, it seems so desirable that the present Thirteenth district should be divided, making two districts of it, special recommendation will be made to Congress at its next session to that end, the new district to include Alaskan waters only, with headquarters at Sitka.

Anticipating the needs of a new tender for use in these waters, Congress, at its last session, appropriated the sum of $100,000 for the purpose of constructing one. Plans and specifications of it are now being prepared, and it is expected to be built during the coming year.

With regard to the aids to navigation proposed, the Board has carefully considered the various petitions and memorials and has made such examination of proposed sites as was found practicable during the past season. As a result eleven stations have been selected and an approximate estimate of cost prepared which is the basis of the recommendation now made that $300,000, be appropriated for the establishment of aids to navigation in Alaskan waters, which appear to be imperatively demanded by the interests of navigation. The localities selected are: Eldred Rock, Ralston Island, Point Retreat, Point Gardner, Cape Ommaney, Point Stanhope, Fairway Island, Guard Island, Mary Island, Cape Fox, and Cape Fanshaw.

WIRELESS TELEGRAPHY.

The Board has watched with interest the development of the use of the wireless telegraph during the year in Europe and the experiments made in this country with it, and hopes that it may be able soon to install the apparatus so that communication may be maintained between some of the light-vessels and the shore in the interests of the Light-House Service.

The Board has stated in previous reports that it had maintained wireless telephonic communication with a cable at the bottom of the ocean and a light-vessel, and thence with a shore station, and that it had been forced to abandon its use for lack of funds for its maintenance. The Board now proposes, with the consent of Congress, to establish either wireless telegraphy or telephony, or both, between certain light-vessels and certain light-houses, as may be found most desirable, and it estimates that $25,000 can be very judiciously expended therefor during the coming year, and therefore recommends that an appropriation of this amount be made.

INCREASED ACCOMMODATIONS FOR THE OFFICES OF THE LIGHT-HOUSE BOARD.

The following recommendation made in the Board's last two annual reports is renewed:

> In previous years recommendation has been made and several times repeated that an appropriation be granted for a separate building for the offices of the Board. Separate buildings have been provided for a number of bureaus of the Treasury and other Departments whose requirements in this respect are certainly not greater than those of the Light-House Establishment.
>
> The urgent demands for sufficient funds to maintain the direct aids to navigation and the conditions necessitating that appropriations be limited to the lowest possible figures have resulted in omitting the recommendation for a new building for the past few years. The business of the Board's office has, however, continued to increase, and the crowded condition and general inadequacy of the rooms now occupied, which are scattered about in various localities in the Treasury Department building, now require that the recommendation for proper office accommodations be renewed and in still more urgent terms. If an appropriation for this purpose be not deemed expedient, possibly a suitable building could be rented, or a building already owned by the Government might be made available for the purpose. An additional advantage would result from procuring necessary accommodations for the Light-House Board elsewhere in relieving to some extent the pressure for increased office room for other bureaus in the Treasury building.

INCREASE OF CLERICAL FORCE.

The following recommendation made in the Board's last annual report is renewed:

> The clerical force employed in the Office of the Light-House Board has not been increased for many years. During this time the work that the force is required to do has been more than doubled.
>
> The Department has recognized the fact that the Board was unable to do this work with the force provided by law, and it has detailed clerks to it from other offices from time to time. The detail has been decreased from five clerks, as it was several years ago, down to one clerk, as it is now.
>
> The Board has recommended, in its annual estimates, that the clerical force be increased, as it feels, unless this is provided, that it will be unable to keep its work up to its own high standard.

Appropriation was made by Congress at its last session to provide two additional clerks to be paid at the rate of $1,000 each, which has been done, but the increase of the work since the estimate was made, and the withdrawal of the remaining clerk detailed from another office, leaves the Light-House Board in the condition it was before. Certain of the recommendations of last year are renewed, and the Board now recommends that two additional clerks, at $720 and $840 each, be provided for.

ESTIMATES OF GENERAL APPROPRIATIONS.

Supplies of light-houses	$500,000.00
Repairs of light-houses	700,000.00
Salaries of light-keepers	800,000.00
Expenses of light-vessels	450,000.00
Expenses of buoyage	550,000.00
Expenses of fog-signals	200,000.00
Lighting of rivers	400,000.00
Survey of light-house sites	1,000.00

Oil houses for light-stations	$15,000.00
Porto Rican Light-House Establishment	50,000.00
Hawaiian Light-House Establishment	25,000.00
Wireless electrical communication	25,000.00

ESTIMATES FOR SPECIAL APPROPRIATIONS.

FIRST DISTRICT.

Boon Island light-station, Maine, keeper's dwelling	$3,400.00
Whitlocks Mill light-station, Maine	250.00
Cape Elizabeth light-station, Maine, keeper's dwelling	3,000.00
Little River Head fog signal, Maine	10,500.00
Burnt Coat Harbor light-station, Maine, roadway	500.00
Isles of Shoals light-station, New Hampshire, fog-signal	5,500.00
Narraguagus light-station, Maine, additional land for boat slip	150.00
The Sisters, Sheepscot River, Maine, day mark	400.00
Halibut Rock, Maine, day mark	325.00
Matinicus Rock light-station, Maine, keeper's dwelling	3,200.00
Buckle Island light and fog-signal station, Maine	14,000.00
Kennebec River lights boat-houses, Maine	1,620.00
Rockland Breakwater, Maine, light and fog-signal station, with small dwelling	30,000.00
Moose Peak light-station, Maine	6,000.00
Tender for engineer First and Second light-house districts	85,000.00

SECOND DISTRICT.

Long Island Head light-station, Massachusetts, removing to new site	4,500.00
State Ledge light and fog-signal station, Massachusetts	42,000.00
Eastern Point light-station, Massachusetts, boathouse	500.00

THIRD DISTRICT.

Black Ledge light and fog-signal station, Connecticut	45,000.00
Jeffreys Hook light and fog-signal station, New York, enlarging	1,400.00
Iona Island fog-signal station, New York	1,200.00
Esopus Island fog-signal station, New York	1,200.00
Pecks Ledge light and fog-signal station, Connecticut	10,000.00
Long Beach beacon light-station, Connecticut	2,500.00
Battery fog-signal station, New York, N. Y	3,600.00
Fire Island range lights, New York	500.00
Plum Beach light-station, Rhode Island, lens apparatus and fog-signal to complete station	2,200.00
Fort Wadsworth, New York, light and fog signal station	10,200.00
Tender for the inspector of the Third light-house district	95,000.00
Staten Island light-house depot, New York	50,000.00

FOURTH DISTRICT.

Cape May light-station, New Jersey, keeper's dwelling	4,000.00
Harbor of Refuge, Delaware Bay, Delaware, light and fog-signal	30,000.00
Edgemoor light-house depot, Delaware, keeper's dwelling, etc	5,000.00

FIFTH DISTRICT.

Ragged Point light and fog-signal station, Virginia	20,000.00
Rappahannock River, additional lights, Virginia	3,300.00
Cape Lookout Shoals light-vessel, North Carolina	90,000.00
Point No Point light-station, Maryland	65,000.00
Baltimore light and fog-signal station, Maryland, additional	60,000.00
Northwest Point Royal Shoal light-station, North Carolina, rebuilding on a safer site	30,000.00
Lazaretto Point light-house depot, Maryland, keeper's dwelling	2,500.00

SIXTH DISTRICT.

Cape Fear light-station, North Carolina, completing	35,000.00
Cape Fear River range lights, North Carolina	3,105.00
Inside passage beacon lights, Georgia and Florida	4,000.00
Reimbursement of losses of light-keepers in Sixth district	2,399.13

SEVENTH DISTRICT.

Hillsboro Inlet light-station, Florida	$90,000.00
Cape San Blas light-station, Florida, completing removal to a new and safe site	15,000.00
Tender for the engineer Seventh light-house district	85,000.00
Reimbursement of losses of light-keeper in Seventh light-house district	124.75

EIGHTH DISTRICT.

Sand Island light-station, Alabama, rebuilding	65,000.00
Sabine Bank light and fog-signal station, Texas	80,000.00
Cubits Gap fog-signal station, Louisiana, keeper's dwelling	2,500.00
Oyster Bayou light-station, Louisiana	5,000.00
Sabine Pass Jetty, Louisiana and Texas, light and fog-signal station	40,000.00
Reimbursement of losses of light-keepers in the Eighth light-house district	2,603.62

NINTH DISTRICT.

Fishermans Shoal light and fog-signal station, Wisconsin	50,000.00
Pointe aux Barques light and fog-signal station, Michigan	32,000.00
Michigan City fog-signal, Indiana	5,500.00
Portage Lake light-station, Michigan, keeper's dwelling	3,500.00
Kewaunee light and fog-signal station, Wisconsin, keeper's dwelling	7,500.00
Peshtigo Reef light-vessel, Green Bay, Wisconsin	15,000.00
Milwaukee Breakwater and Harbor of Refuge, Wisconsin, light and fog-signal	75,000.00
Tender for the engineer Ninth light-house district	85,000.00
Depot for the Ninth light-house district	50,000.00

TENTH DISTRICT.

Toledo Harbor light and fog-signal station, Ohio, completing	37,500.00
Grassy Island Range (Ecorse) light-station, Michigan, keeper's dwelling	5,000.00
Grosse Isle North Channel Range light-station, Michigan, keeper's dwelling	3,500.00
Grosse Isle South Channel Range light-station, Michigan, keeper's dwelling	5,000.00
Cleveland, Ohio, establishing a new site, keeper's dwelling and storehouse	25,000.00
Chapman Shoal light and fog-signal station, St. Lawrence River, New York	25,000.00
Oak Point range lights, St. Lawrence River, New York	10,000.00
Presqu'ile Pierhead, Pennsylvania, keeper's dwelling	3,500.00
Tibbetts Point, St. Lawrence River, New York, keeper's dwelling	3,500.00
Detroit River light-station, Michigan, land for boathouse	1,000.00
Port Clinton light-station, Ohio, keeper's dwelling	3,000.00
Fort Niagara, New York, small light at mouth of river	2,000.00
Tender for the Tenth light-house district	85,000.00

ELEVENTH DISTRICT.

Middle Island light and fog-signal station, Michigan	25,000.00
Crisps Point light and fog-signal station, Michigan	18,000.00
Rock of Ages light and fog-signal station, Michigan	50,000.00
Eagle River light-station, Michigan, moving to Sand Hills	20,000.00
Martins Reef light-vessel, Lake Huron	15,000.00

TWELFTH DISTRICT.

Cape Mendocino light-station, California, keeper's dwelling	5,500.00
Cape Mendocino light-station, California, oil house	1,000.00
Santa Barbara light-station, California, keeper's dwelling and tower	7,500.00
Point Pinos light-station, California, land	2,000.00
Quarry Point fog-signal station, California	6,000.00
Pigeon Point light-station, California, site	5,000.00
New York Slough light and fog-signal station, California	10,000.00
Point Sur light-station, California, keeper's dwelling	6,000.00
Point Buchon light and fog-signal station, California	33,000.00
Humboldt Bay, California, fog-signal	15,000.00

Bonita Point light-station, California, double dwelling	$6,000.00
Fort Winfield Scott fog-signal, California	7,000.00
Relief light-vessel for the Twelfth and Thirteenth light-house districts, Pacific coast	80,000.00
Blunts Reef light-vessel, Pacific Ocean, off Cape Mendocino, California.	90,000.00
Tender for the engineer Twelfth light-house district	90,000.00

THIRTEENTH DISTRICT.

Desdemona Sands light and fog-signal, Oregon, and reappropriating $11,000, balance from Fort Stevens	24,000.00
Point Brown beacon light and fog-signal station, Puget Sound, Washington	6,000.00
Battery Point light and fog-signal station, Puget Sound, Washington	6,000.00
New Dungeness light-station, Washington, keeper's dwelling	4,000.00
Cape Blanco light-station, Oregon, keeper's dwelling	4,500.00
Robinson Point light-station, Washington, keeper's dwelling	3,000.00
Slip Point light-station, Washington, fog-signal	7,000.00
Burrows Island light and fog-signal station, Washington	15,000.00
Semiahmoo light and fog-signal station, Washington	25,000.00
Yaquina Head light-station, Oregon, keeper's dwelling	4,000.00
Tongue Point light-house depot, Oregon	5,000.00
Tongue Point light-house depot, Oregon, engineer's storehouse	4,000.00

FIRST DISTRICT.

This district extends from the head of navigation on the St. C River, Maine, the northeastern boundary of the United States, t including Hampton Harbor, New Hampshire. It embraces all ai navigation on the seacoast of Maine and New Hampshire and on tidal waters between the limits named.

Inspector.—Commander S. W. Nichols, United States Navy, to O ber 10, 1898; since then Commander James K. Cogswell, United St Navy.

Engineer.—Maj. William S. Stanton, Corps of Engineers, Unit States Army.

In this district there are—

Light-houses and beacon lights	
Day or unlighted beacons	1
Fog-signals operated by steam, caloric, or oil engines	
Fog-signals operated by clockwork	
Whistling buoys in position	1
Bell buoys in position	1
Electric bell buoy	
Other buoys in position	6
Steamer *Lilac*, buoy tender, and for supply and inspection	
Steamer *Myrtle*, for construction and repair in the First and Second districts	1
Steamer *Geranium*, buoy tender, and for supply and inspection	1

NOTE.—The number preceding the name of a light-station in the First, Second, Third, Fourth, Fifth, Sixth, Seventh, and Eighth districts is that by which it is designated in the List of Lights and Fog-Signals on the Atlantic and Gulf coasts of the United States, corrected to June 30, 1899.

LIGHT-STATIONS.

1. *Whitlocks Mill, St. Croix River, Maine.*—The following recommendation, made in the Board's last five annual reports, is renewed:

> A light was needed at this place to enable the steamers plying between Eastport and Calais, and especially towboats, to make the difficult turn at the Narrows, a few hundred yards above Whitlocks Mill. The Canadian Government maintains two lights on the left or Canadian bank of the river, and another light was needed on the right or American bank to make the navigation safe at this difficult turn. Hence a red light was, on July 15, 1892, shown from a tree as a temporary expedient. It is now proposed to purchase a site for this light. The owner of the land offers it at a reasonable price. It is estimated that its purchase, together with the legal expenses necessary to obtaining title and cession of jurisdiction, will cost not to exceed $250. Recommendation is made that an appropriation of that amount be made for this purpose, since, without the authority of Congress, the small structure required as a support for the light and to store oil and supplies can not be erected.

3. *Lubec Channel, on westerly edge of the dredged channel from Quoddy Roads to Lubec, Maine.*—The two inclined, movable, and rickety ladders were replaced by two vertical iron ladders bolted to the pier.

4. *West Quoddy Head, entrance to Quoddy Roads, Maine.*—The dwelling was rearranged for use by two families and an addition was built containing four rooms. The barn was moved farther from the dwelling. The station was furnished with a signaling outfit. The characteristic of the fog-signal was changed May 15, 1899.

6. *Avery Rock, Machias Bay, Maine.*—The tower is of brick, 12 feet square, and stands in the center of the dwelling, so dispersing the

rooms occupied by the keeper's family that they can not be kept warm during the long and severe winters of this locality. It is estimated that at a cost not exceeding $1,700 a sufficient number of rooms for one family, arranged so that they can be easily heated, could be provided by adding a second story to part of the dwelling. The Board therefore recommends that an appropriation of this amount be made therefor.

—. *Little River Head, mouth of Little River Harbor, Maine.*—The following recommendation, made in the Board's last two annual reports, is renewed:

> This is the entrance to Cutler Harbor, which is a station of the Eastport, St. John, and Bay of Fundy pilots. Vessels entering the Bay of Fundy first make Libby Islands and then try to make Little River light. It is a harbor of refuge, and is used as such by vessels when they can get in. This, however, is impossible in thick weather without a more effective fog-signal than the bell now on Little River Island. The steamer *Eduardo* was wrecked on Old Man Island in 1889, 2 miles south of Cutler Harbor, and proved a total loss. The crew, numbering 40 in all, were saved. She cost $285,000, and her master stated formally that he was of opinion that the accident would not have occurred had there been a proper fog-signal at this point.
>
> The Board recommended the establishment of a fog-signal there in six annual reports. It is estimated that the establishment of such a signal would cost $10,500, and an appropriation of that amount is therefore recommended.

7. *Libby Islands, entrance to Machias Bay, Maine.*—The landing was improved by the removal of rock by blasting, and storm windows were provided for the keeper's dwelling. A reservoir holding about 40,000 gallons was excavated, mostly from rock, for the fog-signal. The characteristic of the fog-signal was changed May 15, 1899.

The dwelling occupied by the two assistant keepers is too small and is so ill arranged that their two families have but little privacy. It is estimated that at a cost of not exceeding $2,500 it can be rearranged to separate the families, and that an addition can be built. The Board recommends that an appropriation of this amount be made therefor.

8. *Moose Peak, on Mistake Island, seacoast of Maine.*—A telephone line was completed to Jonesport, Me., and the station was supplied with a signaling outfit.

The dwelling occupied by the keeper and assistant keeper is old, in very poor condition, and is past economical repair. The Board proposes to replace it with a new double dwelling. It is estimated that this can be done for not exceeding $6,000, and the Board recommends that an appropriation of this amount be made therefor.

10. *Nash Island, on Nash Island, Pleasant Bay, Maine.*—New windows were put in the dwelling and minor repairs were made to the fuel house and to the boat slip. Some 465 feet of wire fence were built.

11. *Narraguagus, entrance to Narraguagus Bay, Maine.*—The following recommendation, made in the Board's last two annual reports, is renewed:

> The boat slip is in a bad place for landing. It extends to a little more than half tide and is hedged about with ledges, which it would be costly to remove. Delays in landing often occur. An excellent site for a new boat slip can be bought at a little to the north of the present one. It is estimated that such a site can be purchased for not exceeding $150. Recommendation is made that an appropriation of this amount be made.

12. *Petit Manan, on Petit Manan Island, Maine.*—Cellars both for the double and single dwelling were excavated in rock, the dwellings were moved to them, the double dwelling was rearranged, better adapting it to two families, and an L built to it containing four rooms. The abandoned stone dwelling was demolished, the rain shed was extended

about 30 feet, and 760 feet of tramway built from the landing to the fog-signal house. The characteristic of the fog-signal was changed May 15, 1899.

14. Winter Harbor, on south point of Mark Island, west side of entrance to the harbor, Maine.—A partition was built in the L of the dwelling, providing another room.

15. Mount Desert, on Mount Desert Rock, Atlantic Ocean, about 20 miles to southeast of Mount Desert Island, Maine.—A 1½-horsepower Hornsby-Akroyd oil engine and a Clayton air compressor were installed in place of a worn-out caloric engine, and a cooling tank was built for it. The boat slip was renovated, the tower was repointed, and minor repairs made.

16. Egg Rock, Frenchman Bay, Maine.—The tower is of brick, 12 feet square, and stands in the center of the dwelling, so dispersing the rooms that they can not be kept warm during the long and severe winters of this locality. It is estimated that at a cost not exceeding $1,700 a sufficient number of rooms for one family, arranged so that they can be easily heated, could be provided by adding a second story to part of the dwelling. It is therefore recommended that an appropriation of this amount be made therefor.

18. Baker Island, off the entrance to Southwest Harbor, Atlantic Ocean, off Mount Desert, Maine.—A telephone line to Northeast Harbor was completed. Various repairs were made.

19. Great Duck Island, Atlantic Ocean, Maine.—The characteristic of the fog-signal was changed May 15, 1899.

20. Bear Island, at entrance to Northeast Harbor, Maine.—The station was connected with the telephone line from Baker Island to Northeast Harbor, Maine. About 170 feet of plank walk was built.

22. Burnt Coat Harbor, Swan Island, coast of Maine.—The following recommendation, made in the Board's last five annual reports, is renewed:

> This station is situated at the extreme end of the peninsula and is separated from the town by the harbor. In winter the harbor is sometimes filled with ice, so that communication with the town by water can not be relied upon; a roadway for the accommodation of the necessary travel between the public road and the light-station is therefore necessary. The owners of the adjacent land offer to convey right of way to the Government at a nominal price. It is estimated that the legal expenses of obtaining title and cession of jurisdiction to the land thus conveyed, together with the cost of building the road needed, will not exceed $500. Recommendation is made that an appropriation of this amount be made therefor.

24. Saddleback Ledge, near Isle au Haut, Maine.—The lower 35 feet of the boat slip was renewed and heavily bolted to the ledge at extreme low spring tides, two brick cisterns were built, and about 400 square feet of platform laid at the base of the tower.

—. *Buckle Island, entrance to York Narrows, Maine.*—The following recommendation, made in the last two and several previous annual reports of the Board, is renewed:

> The Board is informed that something more than 1,000 sailing vessels, carrying lumber, fish, hay, coal, granite, and general merchandise, annually use this passage. There are also several lines of steamboats, some of which make two trips a day, carrying large numbers of passengers to and from Bar Harbor and other points along the shore, which would be benefited by lights on Buckle Island. In the early spring and late fall steamers, and especially sailing vessels, find it necessary to go through the passage during the night, when a light on Buckle Island would be of great assistance to them. It is further stated that several vessels have been cast away on Buckle Island, among them the schooner *Walter Scott*, which was wrecked in the winter of 1870. It is proposed, if the necessary appropriation is made, to place a

First District.

white light with four red sectors, with a post range light 100 feet in front of the main light. It is estimated that these range lights can be established at a cost not exceeding $14,000, and it is recommended that an appropriation of this amount be made therefor.

30, 31. Matinicus Rock, on Matinicus Rock, Atlantic Ocean, off the southern entrance to Penobscot Bay, Maine.—The boat slip was repaired and improved by the blasting of rock, and the boat slip for the large reserve boat was completed.

The following recommendation, made in the Board's last eight annual reports, is renewed:

> At this important station, which has two second-order lights and a steam fog-signal, a keeper and three assistant keepers are employed. These are the only people living on this rock. Two of the assistant keepers, with their families, live in one double dwelling, and the principal keeper lives in a separate single dwelling. These three sets of quarters are adapted only to the accommodation of three families, and a fourth set of quarters is therefore urgently necessary for the third assistant.
>
> It is estimated that a proper dwelling can be built for $3,200, and recommendation is made that this amount be appropriated for that purpose.

33. Whitehead, entrance to Penobscot Bay, Maine.—An appropriation of $3,400 was made by the act approved on March 3, 1899, for a keeper's dwelling, which will be built this fall. The tank house was rebuilt to provide temporary accommodation for the second assistant keeper. The characteristic of the fog-signal was changed April 10, 1899.

35. Rockland Breakwater, entrance to Rockland Harbor, Maine.—A foundation pier was built near the end of the finished work of the breakwater and the lights were moved to it March 15, 1899.

—. *Rockland Breakwater pierhead light, Maine.*—The harbor of refuge, which the breakwater forms, will lead many sailing vessels to enter it in the stormy season and they will need ample warning of the outer end of the breakwater to avoid getting it too close under their lee, and the disaster of being carried upon it in blinding easterly and northeasterly snowstorms. The harbor of Rockland is entered throughout the year by the steamboats, which, during the summer, when fogs are frequent, carry large numbers of passengers between Boston and Bangor, touching at Rockland. In summer several other steamers also carry passengers into the harbor. On account of the dense fogs in summer and the blinding snowstorms in winter the outer end of the breakwater should be indicated. The Board proposes to establish a light-station on the end of the breakwater to consist of a stone pier supporting a small dwelling with a light, and a small trumpet should a fog-bell give inadequate warning, to save vessels from being carried against the breakwater in driving easterly and northeasterly snowstorms. It is estimated that this can be done for not exceeding $30,000, and the Board recommends that an appropriation of this amount be made therefor.

40. Dice Head, entrance to Castine Harbor, Maine.—About 150 running feet of stone wall was replaced by a wire fence. Various repairs were made.

41. Fort Point, at mouth of Penobscot River, Maine.—The interior of the dwelling was rearranged, providing another room, and three dormer windows were built.

43. Marshall Point, entrance to Herring Gut or St. George Harbor, Maine.—A fog-bell, struck by machinery, was established August 10, 1898.

45. Manana Island Fog-Signal Station, on Manana Island, Maine.—Minor repairs were made to roof of signal house. A Hornsby-Akroyd oil engine and Clayton air compressor were installed in place of a worn-out caloric engine. The interior of the keeper's dwelling was rearranged, and an L, containing two rooms, was built. A concrete floor was laid in the cellar of the assistant keeper's dwelling.

46. *Franklin Island, Muscongus Bay, entrance to St. George River, Maine.*—A boat winch was provided.

47. *Pemaquid Point, entrance to Johns Bay, Maine.*—The Shipman fog-signal engines were replaced by a Stevens striking machine, the signal house was adapted to it, and minor repairs were made to the dwelling.

49. *Burnt Island, entrance to Boothbay Harbor, Maine.*—A brick oil house was built. Minor repairs were made.

52. *Pond Island, Kennebec River, Maine.*—The boat slip was rebuilt and improved.

53. *Perkins Island, west side of Perkins Island, Kennebec River, Maine.*—A gallery with railing was built around the lantern, a boat slip and a flight of landing steps were built, and a concrete floor laid in cellar of dwelling.

54. *Squirrel Point, on the southwest point of Arrowsic Island, Kennebec River, Maine.*—A gallery with railing was built around the lantern, a boat slip and about 70 running feet of plank walks were built, and a concrete floor was laid in the cellar of the dwelling.

55, 56. *Doubling Point Range, near north bank of river, at lower end of Fiddlers Reach, Kennebec River, Maine.*—A boat slip and about 1,000 running feet of plank walks were built, and a concrete floor was laid in the cellar of the dwelling.

57. *Doubling Point, Kennebec River, Maine.*—A boat slip and 90 feet of plank walks were built, and a concrete floor was laid in the cellar of the dwelling.

53–57. *Kennebec River Lights Boat Houses.*—The appropriations made for the establishment of lights at Doubling Point, Doubling Point Range, Squirrel Point, and Perkins Island, Kennebec River, Maine, were insufficient to permit the construction of boat houses. The keepers at all four of these stations use boats almost exclusively for communication with the shore and for obtaining their supplies. The distance by road to the post-office and to points where supplies are obtained is long, and the keepers have no horses. Their boats are without shelter, and hence in winter are filled with snow and ice. It is estimated that it would cost to build a boat house at Doubling Point light-station $430; at Doubling Point Range light-station, $430; at Squirrel Point light-station, $400, and at Perkins Island light-station, $360, making a total for labor $810; material, $810; or a grand total of $1,620. The Board therefore recommends that an appropriation of the last-named amount be made therefor.

59. *Seguin, off the mouth of the Kennebec River, Maine.*—The characteristic of the fog-signal was changed. A reservoir 30 feet by 24 feet by 7½ feet deep was excavated mostly in the ledge for storage of water for the fog-signal. In the fog-signal house the chimney was torn down and replaced by two steel stacks, improving the draft and shortening the interval between lighting the fire and the first blast of the whistle fully 50 per cent—from an hour or more to 28 minutes. The old engines for regulating the blast were replaced by automatic clocks, the boilers were reversed, placing the drums directly under the whistle, and sounding it with drier steam than formerly through the long horizontal pipes,

including many joints, which have been dispensed with, and which were expensive to keep in order by frequent visits of machinists to the station. The change has increased the efficiency of the signal by giving a clearer blast, sounding half an hour sooner in fog, and has diminished the cost of maintenance.

61. Halfway Rock, nearly midway between Cape Small Point and Cape Elizabeth, Maine.—The fog-bell machine was rebuilt in the machine shop at Boston.

62, 63. Cape Elizabeth, on Cape Elizabeth, Maine.—One end of the keeper's dwelling was renewed. The characteristic of the fog-signal was changed May 15, 1899.

The following recommendation has been made in the Board's last eight annual reports:

> There are now four separate families at the station, and two families are crowded into a dwelling adapted in size and arrangement to only one family. The two towers are more than 900 feet apart; two of the dwellings are near the northeast and one near the southwest tower. A fourth dwelling is very urgently needed near the latter to properly and conveniently house in the severe winter weather of that climate the second of the two assistants who attends the light in it. Besides a first and a second order light, the station has a first-class fog-signal, and an additional dwelling is imperatively needed in the best interests of the service.
>
> It is estimated that one can be built for $2,000, and it is recommended that an appropriation of this amount be made therefor.

The estimate made eight years ago is not now sufficient, owing to the increase in the cost of both labor and material. The Board now recommends that an appropriation of $3,000 be made for this purpose.

64. Portland Head, entrance to Portland Harbor, Maine.—The characteristic of the fog-signal was changed on May 15, 1899, and minor repairs were made to the fog-signal house and walks.

65. Spring Point Ledge, westerly side of the main channel into Portland Harbor, Maine.—A storm porch was built and minor repairs were made.

66. Portland Breakwater, Portland Harbor, Maine.—A Stevens striking machine was installed in place of an electric machine for the fog bell.

70. Boon Island, seacoast of Maine.—Rocks were blasted and removed from around the boat slip, which was straightened and repaired.

The following recommendation, made in the Board's last eight annual reports, is renewed:

> There are at this station one keeper and two assistants, and but two sets of quarters in one double dwelling. The second assistant keeper has to board either with the family of the keeper or with that of the first assistant keeper. This forced arrangement is unsatisfactory to all, and is quite unfavorable to the retention of a second assistant of the needed qualifications. The station is isolated and exposed, the tower is tall, and this second-order light is an important one.
>
> A third dwelling, which is urgently needed, it is estimated can be built for $3,400. It is therefore recommended that an appropriation of this amount be made therefor.

71. Whaleback, entrance to Portsmouth Harbor, New Hampshire.—A Hornsby-Akroyd oil engine and Clayton air compressor were installed in place of a worn-out caloric engine. The characteristic of the fog-signal was changed May 29, 1899.

77. Isles of Shoals, New Hampshire.—The following recommendation, made in the Board's last three annual reports, is renewed:

> The fog-signal now on White Island at the Isles of Shoals light is a bell. It falls far short of being adequate to the needs of commerce. A more effective signal is required. It is estimated that this can be established here for $5,500, and it is recommended that an appropriation of this amount be made therefor.

First District.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

2. St. Croix River, Me.
5. Little River, Me.
6. Avery Rock, Me.
9. Moosabec Reach, Me.
11. Narraguagus, Me.
13. Prospect Harbor, Me.
16. Egg Rock, Me.
17. Crabtree Ledge, Me.
22. Burnt Coat Harbor, Me.
23. Blue Hill Bay, Me.
25. Deer Island Thorofare, Me.
26 Goose Rocks, Me.
27. Eagle Island, Me.
28 Pumpkin Island, Me.
29. Heron Neck, Me.
32. Two Bush Island, Me.
34. Owls Head, Me.
36. Browns Head, Me.
37. Indian Island, Me.
39. Grindel Point, Me.
40. Dice Head, Me.
42. Tennant Harbor, Me.
44. Monhegan Island, Me.
48. Ram Island, Me.
50. Cuckolds, Me.
51. Hendricks Head, Me.
67. Wood Island, Me.
68. Goat Island, Me.
69. Cape Neddick, Me.
73, 74. Seavys Island, Me.
75. Jerrys Point, N. H.
76. Frosts Point, N. H.
77. Isles of Shoals, N. H.

LIGHT-VESSELS.

—. *Cape Elizabeth light-vessel, Maine.*—An appropriation of $70,000 was made by the act approved on March 3, 1899, for constructing a light-vessel with a fog signal, to be placed near Cape Elizabeth, Maine. The plans and specifications for this vessel are now in hand, and it is hoped to get her under contract at an early day.

DAY OR UNLIGHTED BEACONS.

Clark Ledge, Prospect Harbor, Maine.—The day mark was repaired.

Saco River, South Jetty spindle, Maine.—An iron spindle, surmounted by a black cask, was established.

Ram Island Ledge beacon, Portland Harbor, Maine.—The tripod was rebuilt.

Halftide Rock spindle, Sullivan Harbor, Maine.—The spindle and cage were replaced.

Halibut Rock day beacon, Jericho Bay, East Penobscot Bay, Maine.—The following recommendation, which was made in the last two annual reports of the Board, is renewed:

> An appropriation of $325 to purchase the site and establish a day beacon on this rock.

The Sisters, Sheepscot River, Maine.—The following recommendation, which was made in the last two annual reports of the Board, is renewed:

> An appropriation of $400 to purchase the site and establish a day beacon on this rock.

FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

4. *West Quoddy Head, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,628 hours during the year, and consumed about 71 tons of coal.

7. *Libby Islands, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,531 hours during the year, and consumed about 79½ tons of coal.

First District.

12. Petit Manan, Maine.—This 10-inch steam whistle, in duplicate, was in operation some 1,859 hours during the year, and consumed about 67 tons of coal.

15. Mount Desert, Maine.—This third-class Daboll trumpet, in duplicate, was in operation some 1,277 hours during the year, and consumed about 5 tons of coal.

19. Great Duck Island, Maine.—This 10-inch steam whistle, in duplicate, was in operation some 1,481 hours during the year, and consumed about 52 tons of coal.

30, 31. Matinicus Rock, Maine.—The signals at this station are a 10 and a 12-inch steam whistle; the 10-inch steam whistle was in operation some 801 hours during the year, and consumed about 38 tons of coal; the 12-inch steam whistle was in operation some 332 hours during the year, and consumed about 22 tons of coal.

33. Whitehead, Maine.—This 10-inch steam whistle, in duplicate, was in operation some 1,427 hours during the year, and consumed about 55 tons of coal.

45. Manana Island, Maine.—This first-class Daboll trumpet, in duplicate, was in operation some 942 hours during the year, and consumed about 14 tons of coal.

50. Cuckolds Island, Maine.—This Daboll trumpet, in duplicate, was in operation some 1,003 hours during the year, and consumed about 6 tons of coal.

59. Seguin, Maine.—This 10-inch steam whistle, in duplicate, was in operation some 1,087 hours during the year, and consumed about 42½ tons of coal.

62, 63. Cape Elizabeth, Maine.—One second-class steam siren, and one 12-inch steam whistle. The steam siren was in operation some 811 hours during the year, and consumed about 34 tons of coal. The 12-inch steam whistle was not in operation during the year.

64. Portland Head, Maine.—This second-class Daboll trumpet, in duplicate, was in operation 892 hours during the year, and consumed about 11½ tons of coal.

71. Whaleback, New Hampshire.—This third-class Daboll trumpet, in duplicate, was in operation some 796 hours during the year, and consumed about 6 tons of coal.

BUOYAGE.

During the year there were established 4 spar buoys and one day or unlighted beacon. There are 14 whistling buoys and 19 bell buoys, all in good condition.

DEPOTS.

Bear Island, Mount Desert Island, Maine.—The coal shed was moved from the shore nearly to the outer end of the wharf, which was straightened by the addition of diagonal braces.

Little Diamond Island, Portland Harbor, Maine.—A brick reservoir, 40 feet in diameter by 8 feet 2 inches deep, holding about 80,000 gallons, was built, and a windmill for the pump was erected. Minor repairs were made to dwelling and barn.

TENDERS.

Lilac.—This steel screw steamer was built in 1892, and is of about 434 tons burden. She was employed throughout the year. She was hauled out in November, 1898, and again in June, 1899, when her bottom was cleaned and painted, and minor repairs were made to her keel and shoe. During the year she was under repairs for 13 days to her boilers and receiving a new dynamo, and exclusive of 6 days on the ways for cleaning and painting. She was employed from 15 to 20 days of each quarter landing coal, rations, and extra supplies at the different light and fog-signal stations. In June, 1899, she was employed 10 days going to New York with 4,600 empty oil cases, returning with chain from the general light-house depot to Little Diamond Island buoy depot, stopping on her return trip at Lovells Island, Mass., light-house depot for a whistling buoy which went adrift from Boon Island Ledge. She was laid up for repairs 19 days. She steamed about 15,298 miles, and consumed some 956 tons of coal. She replaced 57 buoys, changed 119 buoys, painted 374 buoys and 38 spindles, made and ironed 145 buoys. She landed about 173 tons of coal at the different light and fog-signal stations, and did 61 days' work at the light-house depot.

Geranium.—This wooden side-wheel steamer was built in 1863 and is of about 356 tons burden. She did good service in delivering coal and supplies and painting and replacing buoys. From December 15, 1898, to March 15, 1899, she was laid up for the winter. She was hauled out in March, 1899, when her bottom was cleaned and painted, and minor repairs made. During the year she was hauled off forty-two days at different times, exclusive of one day on the railway, for extensive repairs to her boilers and engines, and for repairs to her hull, which was badly damaged in the gale of December 4, 1898, breaking her guards and paddle box on the port side, also breaking her spring beam, 12 inches by 20 inches. She steamed about 5,756 miles and consumed some 663 tons of coal. She replaced 25 buoys, changed 181 buoys, painted 180 buoys and 30 spindles. She landed some 57 tons of coal at different light and fog-signal stations, and did forty days' work at the depot.

Tender for engineer First and Second light-house districts.—The following recommendation made in the Board's last annual report is renewed:

> There is now only one tender, the *Myrtle*, for the construction and repair service of the First and Second districts. This vessel has a wooden hull and was built in 1872. She is the oldest of the few remaining tenders of this general type in the service, and a new steel-hull vessel of modern design and construction should be provided at an early date to assist in maintaining the numerous and increasing aids to navigation on the New England coast. A suitable vessel for this service can be built for $85,000, and an appropriation of that amount is recommended.

SECOND DISTRICT.

district extends from Hampton Harbor, New Hampshire, to Ledge, off Warren Point, Rhode Island, but does not include e harbor or the ledge. It embraces all aids to navigation on oast and tide waters of Massachusetts, excepting those on the n River and that part of Mount Hope Bay lying within the State ry.

ctor.—Commander Thomas Nelson, United States Navy, to Octo- , 1898; Commander H. G. O. Colby, United States Navy, to 30, 1899; since then, Commander J. R. Selfridge, United States

neer.—Maj. William S. Stanton, Corps of Engineers, United Army.

his district there are—

houses and lighted beacons	78
vessels in position	10
vessels for relief	2
unlighted beacons	75
gnals operated by steam, caloric, or oil engines	12
gnals operated by clockwork	10
ghted buoys in position	7
ling buoys in position	11
uoys in position	19
ic-bell buoy in position	1
buoys in position	538
uoys for winter use	11
ners *Verbena*, *Mayflower*, and *Azalea*, buoy tenders and for supply and spection	3
ner *Myrtle*, for construction and repair in the First and Second districts	1

LIGHT-STATIONS.

80. *Newburyport Harbor, mouth of Merrimac River, Massachusetts.*—e light tower was completed and the light was established September , 1898. The interior of the dwelling was remodeled upstairs, increas- g the number and more conveniently arranging the rooms. A piazza as built on two sides of the dwelling and a cistern made in the cellar. arious repairs were made.

84. *Ipswich, south side of entrance to Ipswich Harbor, Massachusetts.*—he front range light, which was discontinued August 2, 1898, was established on a new line February 2, 1899, and a new front beacon was built. Various repairs were made.

87–88. *Cape Ann, Thatcher Island, seacoast of Massachusetts.*—The brick double dwelling was rearranged and a frame L containing one room, cellar, and cistern added. Its exterior was repointed and painted. The keeper's dwelling was raised 3½ feet, a cellar made under it, and the ground filled and graded. The parapets of both towers were repointed and minor repairs made to the covered way, boat slip, and fog-signal machinery. Various repairs were made.

89. *Eastern Point, entrance to Gloucester Harbor, Massachusetts.*—The station was furnished with a signaling outfit. The telephone line to this station was sold at auction. Various repairs were made.

A boathouse with boat ways and boat winch should be built at this point to shelter the boat used by the light-keeper in caring for the gas buoy moored off this light-station. The boat is used for this purpose throughout the year, and the ways and the winch are needed for getting the boat out of the water, and the house to preserve it from the weather. It is estimated that a boathouse with the necessary boat slip and plank along it, with boat winch and ways, can be built for $500, and the Board recommends that an appropriation of this amount be made therefor.

97. Marblehead, entrance to Marblehead Harbor, Massachusetts.—The keeper's dwelling was connected with the city water supply. The station was supplied with a signaling outfit.

104. Minots Ledge, Boston Bay, Massachusetts.—The keeper and one assistant, with their families, occupy an old dwelling converted, about forty years ago, to that use from a barn. It is adapted to the use of but one family, and affords the two families neither the necessary room, privacy, nor conveniences. The double dwelling occupied by the two other assistants with their families is ill arranged. The main part for each family contains but two rooms below and a large, cold, and useless hall. It is necessary to do away with the hall and with the kitchen, which is under a shed roof, and to provide three comfortable rooms on each floor in the main part for each family. While the station is an important one, the dwellings are very inferior, and little has been expended upon them for many years. It is estimated that the rearrangement and renovation of the dwellings can be made for not exceeding $5,500, viz: $2,500 for the dwelling for the keeper and one assistant, $3,000 for the dwelling of the two assistants. The Board therefore recommends that $5,500 be appropriated therefor.

106–107. Boston, entrance to Boston Harbor, seacoast of Massachusetts.—About 100 feet of the south wharf with the boathouse was carried away by the gales of November, 1898. The wharf was rebuilt and about 100 tons of riprap placed for its protection. A new boathouse was built with about 120 feet of boat slip. Various repairs were made.

—. State Ledge, Boston Harbor, Massachusetts.—The following recommendation, which has been made in the last nine annual reports of the Board, is renewed:

> The ship channel, from the Boston wharves to Nix Mate buoy, has no aids to navigation except buoys. Vessels find it very difficult in thick weather and at night to keep in the channel, and they are particularly perplexed to know just where to turn in the neighborhood of State Ledge and buoy No. 8, both in leaving and entering the harbor. Large excursion steamers, as well as steamers of the regular lines running out of Boston, frequently have to anchor in thick weather solely because they have no guide between Nix Mate buoy and the wharves. This greatly incommodes business men going and coming during the summer months when fogs are prevalent. The Board has recognized for a long time the necessity for a light and fog signal at this point, but has postponed action while the improvements in the channel of the harbor in charge of the United States engineers were in progress. Although these improvements have not yet been entirely finished, they are practically concluded in that vicinity, and the Board is of opinion that the time has arrived when a light and fog signal ought to be established near buoy No. 8, or at or near State Ledge. It is estimated that it will cost $42,000 to establish a light and fog signal at this point.

It is recommended that an appropriation of this amount be made therefor.

113. Long Island Head, Boston Harbor, Massachusetts.—The following recommendation made in the Board's last annual report is renewed:

> A new seacoast battery has recently been established near this station. The illuminating apparatus and buildings are endangered whenever the guns in the battery are fired. It is proposed to move the light-station to a new site where it will not be exposed to such injury. This, it is estimated, can be done at a cost not exceeding $4,500, and the Board recommends that an appropriation of this amount be made therefor.

Second District.

121, 122. Plymouth, entrance to Plymouth Harbor, Massachusetts.—The station was furnished with a signaling outfit.

124. Race Point, northwesterly point of Cape Cod, Massachusetts.—A new revolving machine was installed. The station was furnished with a signaling outfit. Various repairs were made.

The assistants' dwelling has only one outer door, besides which the lower hall, stairs, and upper hall have to be used in common by both families. One family has only a kitchen on the lower floor and the other its kitchen and dining room, there being but three rooms on this floor. All other rooms used by both families are reached in common by one flight of stairs. The two families are deprived of privacy and are compelled to intermingle more or less, which causes dissatisfaction and discontent and is unfavorable to retaining assistants of the grade which the light and the first-class fog-signal at Race Point require. The keeper's dwelling has only two rooms on each floor, and he much needs and should have another room on each floor. It is estimated that the dwelling occupied by the two assistant keepers can be remodeled at a cost not exceeding $1,900, and that the keeper's dwelling can be remodeled at a cost not exceeding $900. The Board therefore recommends that an appropriation of $2,800 be made for remodeling the two dwellings as proposed.

127. Mayo Beach, at the head of Wellfleet Harbor, Massachusetts.—The storm of November, 1898, carried away the bulkhead protecting the buildings and the soil about them. The bulkhead was rebuilt and new soil added. Various repairs were made.

128. Billingsgate Island, west side of and near the entrance to Wellfleet Harbor, Massachusetts.—A brick cistern was built, and ventilator cut through the stone underpinning of the oil room. Various repairs were made.

130. Cape Cod, on the highlands, seaward side of Cape Cod, Massachusetts.—A 4-horsepower Hornsby-Akroyd oil engine with Clayton compressor was installed in place of a worn-out caloric engine. The interval between the lighting of the fire and the first blast of the whistle with the caloric engine was about forty-five minutes; with the new apparatus it is ten minutes. Various repairs were made.

131, 132, 133. Nauset Beach, three towers at Eastham, east side of Cape Cod, Massachusetts.—The station was supplied with a signaling outfit. Various repairs were made.

—. Pollock Rip Shoals, Massachusetts.—An appropriation of $80,000 was made March 3, 1899, for establishing a light-house and fog-signal, or a light-ship, at a point north of the bell buoy near the broken part of Pollock Rip Shoals. It has been decided to place a light-vessel on this shoal, and plans and specifications for her construction are being made.

140. Monomoy Point, on Monomoy Beach, Cape Cod, Massachusetts.—The station was supplied with a signaling outfit. Various repairs were made.

The light-keeper's dwelling is old, and all except the frame and sheathing boards are in bad condition. The house, standing on a narrow peninsula, is exposed to the cold winds blowing off the fields of ice. A useless hall separates the rooms, so that they can not be kept warm. A more compact arrangement of the rooms and stairs should be made, so that they can be properly heated. It is estimated that the building can be remodeled and renovated at a cost not exceeding $2,600, and the

Board therefore recommends that an appropriation of this amount be made therefor.

147. Gay Head, Marthas Vineyard, Massachusetts.—The double dwelling occupied by the keeper and his assistant, with their families, is of brick. Its floor is at a level with the ground, and prevents the raising of the grade to turn water from the clay site. Rain driven against the walls and running down them into the ground is retained by the impervious soil, and keeps the cellars and unexcavated ground under the building and the lower rooms so damp that mold and mildew gather on the walls of the rooms and on household articles. The eaves are but nine feet from the ground, and the upper rooms are too low and ill-lighted for convenient use. The house is too damp and unsanitary for safe occupation by human beings. It is estimated that it can be rebuilt, at a cost not exceeding $6,500, and the Board recommends that an appropriation of this amount be made therefor.

153. Bishop and Clerks, Nantucket Sound, Massachusetts.—A new revolving machine was installed. A room in the old bell tower was lined with galvanized iron and fitted up as an oil room. Various repairs were made.

158. Cape Poge, Nantucket Sound, Massachusetts.—A set of quarters in the dwelling was rearranged, much better adapting it to being kept warm, and a well was driven in the cellar. The yards were filled and graded, concrete walk laid, plumbing put in order, and 96 feet of drains laid. The boathouse was rebuilt and enlarged. An oil house was built. Various repairs were made.

161. West Chop, entrance to Vineyard Haven Harbor, Massachusetts.—The red brick light tower was painted white. The cistern in the fog-signal house was connected with the water-supply system of the Vineyard Haven Water Company. Various repairs were made.

162. Nobska Point, entrance to Woods Hole Harbor, Massachusetts.—A covered way was built from the dwelling to the tower, a cistern was built, and minor repairs were made to the dwelling.

165. Tarpaulin Cove, west side of the cove on Naushon Island, Massachusetts.—The boathouse was moved to a better site, refloored, underpinned, and protected by a retaining wall. Various repairs were made.

169. Dumpling Rock, off New Bedford Harbor, Massachusetts.—A cable was laid to connect the station with the telephone line on the mainland. An addition was built to the boathouse and minor repairs were made to the boat slip. Various repairs were made.

170. Butler Flats, New Bedford Harbor, Massachusetts.—The red brick tower was painted white. The 4,000 pound bell with Shipman engine was replaced by a 1,000-pound bell with Stevens striking machine. Various repairs were made.

174. Bird Island, east side of entrance to Sippican Harbor, Massachusetts.—The old lantern and deck were replaced by new ones. Various repairs were made.

175. Wings Neck, entrance to Pocasset Harbor, Massachusetts.—A covered way was built from the dwelling to the tower, and a concrete floor was laid in the cellar. Various repairs were made.

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REPAIRS.

Repairs more or less extensive were made at the following-named stations:

78, 79. Salisbury Beach.
81. Newburyport Upper Harbor.
85. Annisquam Harbor.
86. Straitsmouth.
91. Tenpound Island.
92, 93. Baker Island.
94. Hospital Point.
95. Fort Pickering.
98. Egg Rock.
99. White Rocks.
100. Black Rocks.
101. Sandy Point.
102. Black Marsh Channel.
104. Minots Ledge.
109. Narrows.
112. Deer Island.
113. Long Island Head.
114, 115. Spectacle Island.
120. Scituate Breakwater.
123. Duxbury Pier.
125. Wood End.
126. Long Point.
129. Sandy Neck.
134. Chatham.
144. Nantucket (Great Point).
145. Sankaty Head.
147. Gay Head.
148. Brant Point.
149, 150. Nantucket Cliff.
151. Stage Harbor.
152. Bass River.
154, 155. Hyannis.
159. Edgartown.
160. East Chop.
163. Grassy Island Ledge.
164. Middle Ledge.
168. Cuttyhunk.
171. Palmer Island.
173. Ned Point.

LIGHT-VESSELS.

103. Boston light-vessel, No. 54, Boston Bay, entrance to Boston Harbor, Massachusetts.—This vessel was built of steel in 1892, is of 300 tons burden, has a steam fog-signal, and is moved by her own propeller. During the gale of November 27, 1898, she was dragged somewhat and her windlass was damaged. She steamed back to her station two days later. Her windlass was repaired. On May 10 she was brought in for repairs, hauled out, had her bottom scraped and painted, main deck under forecastle calked, rudder pintles repaired, boilers calked and patched, and one new tube put in. The fog-signal engine was supplied with governor shaft and collar, and the piping to the distiller was renewed. The liberty boat and the main engine were repaired, the water tanks were recemented, and the air-pump was overhauled. She resumed her station May 25, 1899. New doors to the deck houses were made and the window cases and frames were repaired and a dory was supplied. She was supplied with lantern glass, fire extinguisher, engineer supplies, canvas, grate bars, and the like.

136. Pollock Rip light-vessel, No. 47, off Chatham, Cape Cod, Massachusetts.—This composite vessel of about 300 tons burden, was built with a steam fog-signal in 1891. On July 23, 1898, she was struck on her port quarter by a scow towed by the tug *Sandow*, splitting her main rail for about 10 feet. In the gale of November 27, 1898, she parted her moorings, losing 60 fathoms of chain, and after going over the easterly end of Stone Horse Shoal, striking three times, she drifted off to southward. On November 30 she, being unable to get in toward land, was taken in tow by the steamer *Switzerland* and arrived without damage at Delaware Breakwater December 1. She was towed to Staten Island light-house depot by a tender from the Fourth light-house district, where she was taken in charge by the tender *Mayflower* and towed to Woods Hole light-house depot, where she arrived on December 9, resuming her station on the 13th. On the night of January 10, 1899, the barge *Stafford*, of Taunton, Mass., came in collision with this

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light-vessel, breaking the anchor stock and the facing of the stem. The owners of the barge paid the bill for her repair. On June 16 she was brought to New Bedford for repairs, which consisted of hauling vessel out and repairing her copper, and putting on a new streak at the water line, putting in two new scuppers and repairing old scuppers, putting in a new hawse pipe, repairs made to the shoeing, putting on a new rudder, overhauling the lantern winches, lanterns, lamps, riding bitts, bulwarks, rudder casing, windlass, sea and gate valves, boilers and boiler piping, and supplying a new steam dome, smokestack, and umbrella, also two new sail masts. She was supplied during the year with lantern glass, blocks, galley ware, springs for riding stopper, fire extinguisher, hand grenades, engineer supplies, grate bars, and curtains, and the reflectors were replated, and the liberty boat was repaired.

141. Shovelful Shoal light-vessel, No. 3, off Monomoy Point, Cape Cod, Massachusetts.—This wooden vessel, of about 140 tons burden, was built in 1853. On February 13, 1899, she was dragged about half a mile to the eastward off her station by ice. She was replaced two days later. On May 11, 1899, she was towed to New Bedford for repairs, which consisted of hauling the vessel on railway and patching her copper, repairing her lantern, chain boxes, water-closets, rail stem, lantern winch, windlass, pumps, rudder, and smoke pipe of galley stove. New hawse pipes were put in, the lower hawse pipes were renewed, new mast hoops supplied, berths were put in for the crew, new sail mast was supplied, the deck was calked, the rigging was overhauled, and the old catheads were renewed. She was supplied during the year with copper lightning rod, blankets, life-preservers, stovepipe, galley ware, dory, hose, and the like.

142. Handkerchief light-vessel, No. 4, Nantucket Sound, Massachusetts.—This wooden vessel, of about 104 tons burden, was built in 1855. On August 15, 1898, she was run into by the schooner *Gypsum Emperor*, damaging her stem, cathead, and spare boat. Relief light-vessel No. 9 was placed on the station August 18 and light-vessel No. 4 was brought in for repairs, the cost of which was paid by the owners of the schooner. Light-vessel No. 4 resumed her station on September 9, 1898. During the gale of November 27, 1898, she was dragged to a position about midway between her station and the Cross Rip light-vessel station. Her spare anchor was broken, she lost her mushroom and 45 fathoms of chain, and her starboard hawse pipe was started. She was replaced on her station on December 4, 1898. On January 9, 1899, she was brought in for repairs to her hawse pipe, mast stay, windlass brake, yellow metal, etc., and she was replaced on her station February 2, 1899. On February 13 she dragged about a mile southwest of her station and was replaced two days later. On June 6, 1899, a coal barge in tow came in collision with her, slightly damaging her stem, which was repaired by her master. She will have to come in again for repairs to hawse pipe, copper on bottom, and tiller. She was supplied during the year with life-preservers, galley ware, manila stopper, canvas, etc., and her boat was repaired.

143. Great Round Shoal light-vessel, No. 42, off Nantucket, Massachusetts.—This wooden vessel, of about 410 tons burden, with a steam fog-signal, was built in 1877. On November 23, 1898, she was brought to New Bedford and repairs made to salt-water pipes and tanks, water-closets, trolley bars, bilge pipes, hood of whistle dome, and exhaust pipes, new braces for tank, new masts were supplied, the rigging was overhauled, repairs were made to the cabin gangway and skylight, the lantern house was covered, as were the doors about the ship, collars were put around the masts, and the like. The deck was calked and fog-signal machinery was overhauled and some new parts supplied. She was returned to her station on January 3, 1899. During the year she was supplied with governor-ball arms and valve box, etc., for the fog-signal machinery, cylinder oil, life-preservers, lantern glass, engineer supplies, etc.; the medicine chest was replenished.

146. Nantucket Shoals light-vessel, No. 66, about 41 miles to the southward and eastward of Nantucket, Massachusetts.—This composite vessel was built in 1895–96. She is a screw steamer and has a steam fog-signal. On September 26, 1898, this vessel came in for repairs. She was hauled out and copper repaired, decks calked, fog-signal machinery and boilers were overhauled. She started from New Bedford for her station, arriving there November 3, 1898. On February 13, 1899, during a severe gale, she parted her moorings, losing 120 fathoms of chain, and arrived at New Bedford on February 16, under her own steam. Relief light-vessel No. 58 left New Bedford to replace her on the morning of February 17. Repairs were made to the boilers and rudderhead of light-vessel No. 66, and she left New Bedford on February 25 for her station. On March 29 she again parted her moorings during a heavy gale, losing the mushroom and 120 fathoms of chain and drifting 30 miles east of her station. After the wind moderated steam was got up and the station was resumed on the 31st, where she anchored. Not deeming it safe for her to remain at single anchor, on April 5 relief light-vessel No. 58 left New Bedford and relieved light-vessel No. 66, the latter arriving at New Bedford April 7; and upon receipt of a new chain, which had been brought by the tender *Azalea* from the Staten Island light-house depot, she left New Bedford on May 1 for her station. She was supplied during the year with engineer supplies, electric lamps, engine oil, galley ware, furnace-door shields, oilcloth, etc., and the medicine chest was replenished.

156. Cross Rip light-vessel, No. 5, Nantucket Sound, Massachusetts.—This wooden vessel of about 103 tons burden, new measurement, was built in 1864. On March 17, 1899, the schooner *Abner Taylor*, of Calais, Me., came in collision with this vessel, slightly damaging the forestay and a side port; the starboard cathead was also carried away. The cost of the repairs was paid by the owners of the schooner. On April 2, 1899, the light-vessel was run into by the schooner *Lucinda Sutton*, which inflicted serious injury, the foremast being broken below the eyes of the rigging, carrying the day mark to the deck, both top masts were broken, the bow breasthook was cracked, the starboard bulkheads were crushed and split for about 15 feet, the anchor was broken, the stern of long boat was crushed, the smokestack was crushed, the lamps were broken, the spring stay was damaged, and some of the shrouds were strained. All this damage was repaired in New Bedford, and the bills therefor were paid by the owners of the schooner. Relief light-vessel No. 9 was put on the station on April 4, and light-vessel No. 5 was brought in, when other repairs, not caused by the accident, were found necessary, consisting of a new mainmast and rigging, new hawse pipe on the port side, a new brake for the windlass, drum gear for the winch, repairs to the rudder, etc. When she was hauled out the copper was also repaired and the upper streak of metal was renewed in sheet brass. Her catheads were permanently removed. She resumed her station May 11, 1899. She was supplied during the year with life-preservers, lantern glass, galley ware, etc., and the liberty boat was repaired.

157. Succonnessett Shoal light-vessel, No. 6, Nantucket Sound, Massachusetts.—The date when this wooden vessel was built is not known, but she was thoroughly repaired in 1880. She is of about 140 tons burden and has a bell for a fog-signal. In the gale of November 27, 1898, her windlass was broken and her riding bitts and forward deck, etc., were started. On December 14, 1898, she was brought in, when repairs were made to her windlass, riding and windlass bitts, hawse pipes, and the planking of the forecastle deck, after which she resumed her station on January 8, 1899. She was supplied with life-preservers, manila stopper, galley ware, etc., and her medicine chest was replenished.

166. Vineyard Sound light-vessel, No. 41, western entrance to Vineyard Sound, Massachusetts.—This wooden vessel is of about 387 tons burden, old measurement, and was built in 1876. She has a steam fog-signal. She remained on her station during the year. No repairs were made, but some will soon have to be made. She was supplied with sails, log lines, mattress covers, lantern glass, stovepipe, canvas, bed linen, galley ware, engineer supplies, etc., and her medicine chest was replenished.

167. Hen and Chickens light-vessel, No. 2, entrance to Buzzards Bay, Massachusetts.—This wooden vessel was built in 1849. She is of about 120 tons burden, new measurement, and has a bell for a fog-signal. In the gale of November 27, 1898, she broke adrift and went to sea. She worked in toward Nantucket, but taking another gale, went offshore, finally arriving at Dutch Island, Rhode Island, on December 5, 1898, when the tender *Azalea* took her in tow and replaced her on her station on December 9. She was supplied during the year with hose, life-preservers, manila stopper, stovepipe, etc., and a new liberty boat was furnished to replace the one lost in June, 1898.

Relief light-vessel No. 9.—This wooden vessel was built in 1857. She is of about 103 tons burden, new measurement, and has a bell for a fog-signal. On August 18, 1898, she was put on Handkerchief Shoal light-vessel station and remained there until September 9, 1898, when she was withdrawn. She was placed on Pollock Rip light-vessel station on December 2, 1898, and was withdrawn on December 13, 1898. She was placed on Succonnessett light-vessel station on December 14, 1898, and withdrawn January 8, 1899. On January 9, 1899, she was placed on Handkerchief Shoal light-vessel station and was withdrawn on February 2, 1899, and on April 4, 1899, she was placed on Cross Rip light-vessel station and was withdrawn on May 11, 1899, and on the same date was placed on Shovelful Shoal light-vessel station. This vessel is in condition to proceed at any time to a light-vessel station as a relief light-vessel. She was supplied with life-preservers, lightning rod, and hose, and her medicine chest was replenished.

Relief light vessel No. 58.—This iron vessel was built in 1894. She is of about 449 tons burden, has a steam fog-signal and a propeller. On September 26, 1898, she was placed on the station of light-vessel No. 66, and on October 16, while on this station, she went adrift and dragged about 17 miles southeast, with 125 fathoms of chain out. She was replaced on the station by the tender *Azalea* on October 21, no damage to vessel or ground tackle having been incurred. On November 3, light-vessel No. 66 having returned, light-vessel No. 58 came into New Bedford. On November 23, 1898, she was placed on

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Great Round Shoal light-vessel station, and the other vessel brought in for repairs, light-vessel No. 58 remaining until January 3, 1899, when light-vessel No. 42 resumed her station. She left New Bedford for the station of light-vessel No. 66 on the morning of February 17, and when she was relieved by light-vessel No. 66 she returned to New Bedford, arriving there February 27. In December, 1898, she was hauled out and her bottom was scraped and painted and new hawse pipe was put in. On April 5, 1899, she went from New Bedford and relieved light-vessel No. 66 on Nantucket Shoals station, returning to New Bedford May 4. On May 8 she left New Bedford and relieved light-vessel No. 54 off Boston, and on May 10, repairs to the latter vessel having been completed, she resumed her station May 25 and light-vessel No. 58 came into Boston Harbor for slight repairs to the iron of her mast, after which she returned to New Bedford. On June 16, 1899, she was placed on Pollock Rip light-vessel station, the latter vessel coming in for repairs. In March a heater was installed in connection with the fog-signal, with a view to prevent the need for keeping up banked fires and to enable the fog-signal the sooner to get into operation when necessary. During the year she was supplied with blocks, engineer supplies, bunker plates, steam whistle, hose, valves, and the like. Her boat was repaired and new main boom furnished.

DAY OR UNLIGHTED BEACONS.

By the gale of November 27, 1898, the spindle on Black Rock, Gloucester Harbor, was badly damaged, the cage of the spindle on Cat Island, Marblehead Harbor, was blown down, the Harding Ledge Day Beacon was carried away, and Tobias Rock spindle bent halfway over. In February, 1899, damage to several spindles was occasioned by ice; Lobster Rock, Annisquam, was thrown over on its side, Little Aquavitæ and Abbott Rock Beacon, Salem Harbor, also Spindle Rock, Edgartown Harbor, were carried away. In June, 1899, the dolphin in the channel leading into Winthrop, which was carried away by the ice during the winter, was rebuilt. Several beacons were painted by tenders' crews, and several need repairs.

Lobster Rock Beacon, Annisquam Harbor, Massachusetts.—The beacon was rebuilt.

Black Rock Spindle, Gloucester Harbor, Massachusetts.—The spindle was straightened and cage repaired.

Hardy Rock Beacon, Salem Harbor, Massachusetts.—The spindle and day mark were replaced.

Little Aquavitæ Beacon, Salem Harbor, Massachusetts.—The spar and day mark were replaced.

Abbott Beacon, Salem Harbor, Massachusetts.—The beacon was rebuilt.

Cat Island Beacon, Salem Harbor, Massachusetts.—The spar and day mark were replaced.

Bowditch Beacon, Salem Harbor, Massachusetts.—The spindle and day mark were replaced.

Winthrop Channel dolphin, Boston Harbor, Massachusetts.—The dolphin was rebuilt.

South Beacon, Scituate Harbor, Massachusetts.—The spindle and day mark were replaced.

Pierhead Beacon, Plymouth Harbor, Massachusetts.—The beacon, with day mark, was rebuilt.

Spindle Rock Beacon, Edgartown Harbor, Massachusetts.—The spindle and day mark were replaced.

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FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

87–88. Cape Ann, Massachusetts.—This 10-inch steam whistle was in operation some 195 hours and consumed about 42 tons of coal.

89. Eastern Point light-station, Massachusetts.—This 4,000-pound fog bell was in operation some 553 hours and consumed about 503 gallons of mineral oil.

103. Boston light-vessel, No. 54, Massachusetts.—This 12-inch steam chime whistle was in operation some 705 hours and consumed about 120 tons of coal, besides what was needed for heating ship. In addition, 14 tons were used, making a total of 134 tons consumed.

106. Boston, Mass.—This first-class steam siren was in operation some 789 hours and consumed about 32 tons of coal.

124. Race Point, Massachusetts.—This 12-inch steam whistle was in operation some 830 hours and consumed about 36 tons of coal.

130. Cape Cod, Massachusetts.—This first-class Daboll trumpet was in operation some 1,068 hours and consumed about 14 tons of coal. A kerosene engine to operate the trumpet was installed in May.

139. Pollock Rip light-vessel, No. 47, Massachusetts.—This 12-inch steam chime whistle was in operation some 1,234 hours and consumed about 118 tons of coal; besides, for heating ship, etc., 9 tons in addition were used, making a total of 127 tons consumed.

143. Great Round Shoal light-vessel, No. 42, Massachusetts.—This 10-inch whistle, operated by compressed air, was in operation some 1,116 hours and consumed 4,546 gallons of mineral oil.

146. Nantucket Shoals light-vessel, No. 66, Massachusetts—This 12-inch steam whistle was in operation some 1,273 hours and consumed about 173 tons of coal; besides, for electric lighting and heating the ship, 291 tons in addition were used, making a total of 464 tons consumed.

161. West Chop, Massachusetts.—This 10-inch steam whistle was in operation some 559 hours and consumed about 32 tons of coal.

166. Vineyard Sound light-vessel No. 41, Massachusetts.—This 12-inch steam whistle was in operation some 1,243 hours and consumed about 112 tons of coal; besides, for heating ship, etc., 20 tons in addition were used, making a total of 132 tons consumed.

169. Dumpling Rock light-station, Massachusetts.—This Daboll trumpet was in operation 862 hours and consumed 998 gallons of mineral oil.

170. Butler Flats light-station, Massachusetts.—This 4,000-pound fog-bell was in operation 385 hours and consumed 349 gallons of mineral oil. A Stevens bell-striking machine was substituted for the Shipman oil engine in May, 1899.

—. *Relief light-vessel No. 58, Massachusetts.*—This 12-inch steam whistle was in operation some 355 hours and consumed about 14 tons of coal.

BUOYAGE.

On July 28, 1898, a bell buoy was established on Howland Ledge, about 4½ miles northward of Plymouth (Gurnet) lights. On August 6, 1898, two black can buoys, placed to mark the channel through the mine fields between Deer Island and Long Island Head lights, were discontinued. On September 6, 1898, a lighted gas buoy was placed to mark the wreck of a schooner sunk in Broad Sound, and was removed October 3, 1898. On September 16, 1898, the nun buoy at the south end of Centurian, Boston Harbor, was discontinued, and the can buoy at

Georges Island Rocks, Boston Harbor, was replaced by a gas buoy; north end of Centurian gas buoy was discontinued and replaced the can buoy at Georges Island Rocks. On September 19, 1898, a gas buoy was placed to mark the wreck of the *Alice C. Jordan*, sunk in the vicinity of Cottage City, Vineyard Sound, and was discontinued September 30, the wreck having broken up. In September the gas buoys on Centurian Ledge, Boston Harbor, and marking the wreck of the schooner sunk near Cross Rip light-vessel, Vineyard Sound, were run into and in each case the buoy was badly damaged.

On September 22, 1898, the spar buoys Nos. 4 and 6, marking, respectively, the 13 and 15 foot shoals to the southward and eastward of Georges Island, Boston Harbor, removed on account of mines, were replaced in position. In the gale of November 27, 1898, the bell buoy, broken part of Pollock Rip, the Off Gurnet Point whistling buoy, the Southeast Breakers buoy, off Salem Harbor, the Great Fawn Bar bell buoy, Avery Ledge bell buoy, Oak Rock buoy, Cape Ann whistling buoy, Orion Shoal bell buoy, and Chatham Bar whistling buoy were all either dragged or went adrift from their stations, some being lost. The Off Gurnet Point whistling buoy went ashore and the Chatham Bar whistling buoy was picked up and towed into Nantucket. On January 14, 1899, the electric bell buoy plant of the Fairbanks Electric Bell Buoy Company was purchased, and the electric bell buoy at State Ledge, for a long time under trial, became the property of the Light-House Establishment. This buoy is held in great favor by the maritime community. On February 2, 1899, a flash gas buoy was placed to mark the wreck of the schooner *Fannie Flint*, sunk about 1¼ miles SW. by W. ¾ W. from Pollock Rip light-vessel. This buoy was taken up June 2, 1899, the wreck having been removed. In March, Outer Bar, red, nun, No. 2, channel into Newburyport Harbor, was discontinued. In taking up Nobska bell buoy, two other bell buoys were recovered from the bottom and 90 fathoms of chain and 2 sinkers. On March 2, 1899, Normans Woe bell buoy and the End of Breakwater gas buoy, Gloucester Harbor, taken up February 18, 1898, on account of running ice, were replaced in position. On March 6, 1899, a second-class nun buoy (placed December 20, 1897), to mark the wreck of the schooner sunk in Boston Bay, off Egg Rock light-house, was removed, the wreck having disappeared. On March 7, 1899, several buoys were relocated to conform to changes in the channel leading into Nantucket Harbor. On March 25, Inner Seal Rock dolphin and Outer Seal Rock dolphin, going into Hull from Nantasket Roads, Boston Harbor, having been carried away by ice, the rocks were marked by spar buoys; later the dolphins were discontinued and the buoys were made permanent. On March 25, 1899, four buoys in Boston Harbor, placed June 3, 1898, to mark a channel for steamers running between Boston and Hull, and made necessary on account of the placing of mines in the harbor, were made permanent and taken up on the buoy list. On April 3, 1899, a wreck in Hyannis Harbor was marked by a red and black horizontal striped buoy. This buoy was taken up June 5, the wreck having been removed. On April 3 a wreck in Weymouth Fore River, near Quincy Point, was marked by a red and black horizontally striped spar buoy. In April the bell buoy on the broken part of Pollock Rip was picked up adrift off Great Point and towed into Nantucket Harbor. On April 14, 1899, a black spar buoy was established in the channel leading to Nantucket Harbor. On April 15, 1899, a fishing schooner picked up, off Sankaty Head, the Chatham

Bar whistling buoy and towed it to off Wood End, Provincetown, delivering it to tender *Verbena.* On June 28, 1899, the second-class nun buoy marking Sand Spit, near Dumpling Rock light-station, New Bedford, was removed and a bell buoy substituted for it.

DEPOTS.

Lovells Island, Boston Harbor, Massachusetts.—A few piles, some capping, and about 500 square feet of planking were renewed in the wharf.

Machine and lamp shop, Boston, Mass.—Extensive repairs were made here to the fog-signal machinery and illuminating apparatus of most of the stations in the First and Second light-house districts.

TENDERS.

Mayflower.—This steel screw steamer of about 572 tons burden was returned by the Navy Department to the Light-House Establishment on September 9, 1898, at Norfolk, Va., and arrived at Boston on September 23. Extensive repairs were found necessary on account of her condition after service in the war. The plumbing throughout ship and ports and deadlights were renewed where necessary; the cargo boat was built up and the other boats were repaired, both engines were lined up, overhauled, and defective parts were renewed. The iron and brass work of the deck was replaced, including boat davits, awning stanchions, rails, and the like. The decks in wake of the gun mounts were renewed. The pilot house, storerooms, cabins, mess rooms, sheathing of forward deck, hatch coamings, ladders, water-closets, and furniture were overhauled, the ship was painted throughout, the galley was refitted, a new range was supplied, electric bells and whistle were refitted, the cabins, officers' mess room and men's quarters were supplied with new outfit, and carpets for the saloon and staterooms, portieres, curtains, and upholstery supplied, and the mattresses, pillows, and blankets in the forecastle were renewed. The expense, $6,298.50, was paid by the Light-House Board from war appropriations. On December 3, 1898, she went to Staten Island light-house depot and took on board buoy chain, etc., and then towed the Pollock Rip light vessel No. 47 to Woods Hole light-house depot, the tender *Zizania* having towed her from Delaware Breakwater to Tompkinsville. In January, 1899, the tubes of her boiler and her ventilators were repaired. In March her boilers were retubed, and the vessel was hauled out, when her bottom was scraped and painted, the pistons of her engines were fitted with packing, and the valves and seats of the engine were planed. In May the derrick boom was broken, getting in a buoy, and a new one was supplied. In the latter part of June orders were given that there be installed on board this tender an electric-light plant, consisting of a single vertical engine, mounted on an iron bedplate, a 12-inch projector search light, a switch board of polished slate, and six circuits. The vessel was wired for ninety-one various outlets, so that the oil lamps were dispensed with. All electric lamps were furnished complete. From the date of her arrival at Boston, on September 23, 1898, to October 21, the time was consumed in getting bids for her repairs, occasioned by war service. These repairs were completed and she went into the Light-House Service as a tender on December 1, 1898, since which time she has been in constant use, with exception of eleven days when laid up for repairs. She has changed or replaced 297 buoys, painted 132 buoys, painted 21 beacons, marked a wreck, delivered to light vessels and stations 186 tons of coal, besides delivering 68 loads of rations and supplies. She steamed about 7,869 miles and consumed some 842 tons of coal. She was supplied during the year with lamps, barometer, blocks, bulkhead lanterns, crockery, glassware, hose, rope, grate bars, chime whistle, and engineer supplies. Her launch was repaired and her compass was adjusted.

Azalea.—This steel screw steamer was built in 1891, and is of about 423 tons burden. She was constantly employed except for 30 days when under repairs. She changed or replaced 162 buoys, painted 125 buoys and 1 beacon, and marked 3 wrecks. She delivered to light-vessels and stations 441 tons of coal, besides delivering 207 loads of rations and supplies. She was employed 16 days at the buoy depot. She steamed about 11,647 miles and consumed some 1,056 tons of coal. On July 19, 1898, she went to the Staten Island light-house depot, where she took on board oil and supplies for light-stations in the southern part of this district and then delivered them. In August, 1898, repairs were made to her boilers and steam pumps. On October 24, 1898, she was hauled out on the ways and her bottom was scraped and painted. On December 8, 1898, she went to Dutch Island, R. I., and towed light-vessel No. 2 to her station, after having spent several days searching for the drifting vessel. In January, 1899, her deck was calked and steering gear was overhauled. From February 10 to 27, 1899, she was under repairs to boilers, old patches being removed and larger ones put on. On April 9, 1899, she came from New Bedford to Lovells Island light-house depot, taking on board 4,095 empty oil cans, and on April 25 she started from New Bedford for Staten Island light-house depot, returning to the Woods Hole light-house depot on May 1, 1899, with a load of buoys and light-vessel chain. On May 7, 1899, repairs were made to the steam chest of her main engine, and a delivery pipe of her air pump. An exhaust pipe for her hoisting engine and a new crank shaft to hoisting engine was supplied. During the year she was furnished with crockery, plated ware, engineer supplies, blankets, rope, galley ware, ladder, anchor stock, blocks, clock, and boat hooks.

Verbena.—This wooden side-wheel steamer was built in 1870, and is of about 294 tons burden. She was constantly employed except for 68 days when under repairs. She changed or replaced 372 buoys and 42 beacons, and marked 2 wrecks. She delivered to light-vessels and stations some 304 tons of coal, besides delivering 106 loads of rations and supplies. She was employed 18 days at the buoy depot, steamed about 6,457 miles, consuming some 992 tons of coal. This tender delivered the annual quantity of oil and supplies to the light-stations in the northern part of the district, which were received from the Staten Island light-house depot. On July 13, 1898, repairs were made to her boilers and again in November they were further repaired. On the evening of November 25, 1898, while coming up Boston Harbor the tender came in collision with a ferryboat. The tender was struck on the starboard side of the bow, breaking the stem and the bulwarks on the bows, abaft the hawse pipe, down to the deck and damaging the guards on the starboard bow for about 25 feet, also the waterways and the forward towing bitts. From February 1 to February 14, 1899, she was under repairs to her boilers. This tender was hauled up for repairs May 24, 1899, when the rudder gudgeons were bushed, the pintles were rounded up, the copper was patched, the port sponson was calked, the deck was repaired, new holding-down bolts to engine were put in, a

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new feed pump, a piston rod and a piston were supplied, the steam valves were ground, the smokestack was repaired, the steering engine was overhauled, the cylinder was filed and rounded up, the crosshead pins were filed and the boxes were rebored. She was supplied during the year with engineer stores, canvas, rope, shovels, inspirator, rubber hose, pillows, galley ware, marine glasses, table linen, crockery, and plated ware.

Myrtle.—This wooden screw steamer was built in 1872, and is of about 848 tons burden. She was used for construction, repairs, and general service in the First and Second districts, steamed about 12,080 miles, and consumed some 777 tons of coal. Minor repairs were made to her boiler and machinery.

Tender for engineer First and Second light-house districts.—The following recommendation, made in the Board's last annual report, is renewed:

> An additional tender for the construction and repair service in the First and Second districts is recommended in the portion of the report referring to the First district.

3

THIRD DISTRICT.

istrict extends from Elisha Ledge, off Warren Point, Rhode o a point on the coast of New Jersey opposite Shrewsbury nd includes the ledge and the rocks. It embraces all aids to on on the coasts of Rhode Island, Connecticut, and New York, ew Jersey northward of the point opposite Shrewsbury Rocks, all tidal waters tributary to the sea or Long Island Sound the limits named, together with the aids on Whitehall Nar- d on the United States waters of Lakes Champlain and Mem- gog.

ector.—Capt. Edwin M. Shepard, United States Navy.

ineer.—Lieut. Col. David Porter Heap, Corps of Engineers, United Army.

re are in this district—

-houses and beacon lights, including 98 post lights	260
-vessels in position	8
-vessels for relief	4
or unlighted beacons	47
-signals operated by coloric or oil engines	22
-signals operated by clockwork	57
tric-lighted buoys	11
-lighted buoys	12
istling buoys in position	5
buoys in position	30
er buoys in position	564
mer *Armeria*, used for supplying the light-stations of the Atlantic and Gulf asts	1
mers *John Rodgers* and *Cactus*, buoy tenders, and for supply and inspection light-stations	2
mer *Gardenia*, buoy tender and for freight	1
mers *Mistletoe* and *Rose*, used for works of construction and repair of light-ations, fog-signals, and day beacons	2
mer *Nettle*, for works of construction and repair on Lake Champlain	1
m launch *Daisy*	1

LIGHT-STATIONS.

78. *Beavertail, entrance to Narragansett Bay, Rhode Island.*—Two horsepower oil engines for the fog-signal were received and will be talled soon. The characteristic of the light was changed from third-er fixed white to fourth-order flashing white, showing a group of 8 hes succeeding one another at intervals of 2 seconds, followed by ark interval of 15 seconds. Various repairs were made.

79. *Castle Hill, Narragansett Bay, Rhode Island.*—A set of new del fifth-order lamps for lens were furnished. The color of the upper f of the tower was changed from gray to white.

84. *Gull Rocks, entrance to Newport Harbor, Rhode Island.*—The ck lanterns were replaced by lens-lanterns. Various repairs were de.

87. *Hog Island Shoal, Narragansett Bay, Rhode Island.*—By act proved March 3, 1899, an appropriation of $35,000 was made for ablishing a light and fog-signal station to take the place of this light-sel. The structure is to be an iron cylinder filled with concrete and rmounted by an iron tower. A preliminary examination of the site s made in June, 1899.

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194. Plum Beach, Narragansett Bay, Rhode Island.—The erection of the seventh additional course of cylinder plates and superstructure of this station under contract was completed on May 30, 1899. On June 30, 1898, the fog-signal was discontinued; on October 11, 1898, it was reestablished. A fourth-order light, flashing white every 5 seconds, was established and the station was painted—the cylinder black and the superstructure white below and brown above, surmounted by a black lantern.

The amount originally appropriated for the establishment of this station was insufficient to equip it with a lens apparatus and fog-signal. A temporary lens apparatus has been installed, which was on hand at the depot, and should be replaced. It is estimated that such an apparatus would cost $857, and it is recommended that an appropriation of this amount be made therefor.

It is also estimated that a fog-signal could be established at a cost of $1,343, and it is recommended that an appropriation of this amount be made therefor.

200. Conimicut, Providence River, Rhode Island.—A red sector was placed in this light to cover Ohio Ledge, Narragansett Bay.

202. Sabine Point, Providence River, Rhode Island.—A wooden landing platform was built. A fog bell and a striking machine, with material for installation, were delivered.

203. Pomham Rocks, Providence River, Rhode Island.—The preparation of the blower siren signal for this station was taken in hand. Repairs were made.

206. Point Judith, entrance to Narragansett Bay, Rhode Island.—Some 250 feet of 4-inch sewer pipe was laid and fitted. The old lens apparatus was replaced by new with improved flashing gear. The color of the upper half of the tower was changed from white to brown.

207. Block Island (North), entrance to Block Island Sound, Rhode Island.—Telephone connections were made on July 20, 1898, with the Weather Bureau and life-saving station. Various repairs were made.

210. Block Island (SE.), entrance to Block Island Sound, Rhode Island.—A new telephone was fitted and connections established with Block Island (N.) light-station, the two life-saving stations, and the Weather Bureau. An addition was built to the barn. The abandoned Coast Signal Service house was removed to the shore end of Great Salt Pond Harbor Breakwater. Various repairs were made.

211. Great Salt Pond Breakwater, Block Island, Rhode Island.—A fixed red lantern light and a blower siren, operated by a 2-horsepower oil engine, sounding a continuous blast during thick or foggy weather, were established in the structure erected on the outer end of the breakwater. Under contract 800 tons of riprap were furnished and placed, 600 tons on the sea side and 200 tons on the channel side of the breakwater.

212. Great Salt Pond Breakwater (inner end) Beacon, Block Island, Rhode Island.—A white lantern light was established on October 25, 1898. The abandoned Coast Signal Service house at Block Island (SE.) light-station was removed to this point and fitted for the use of the keeper.

216. Latimer Reef, Long Island Sound, New York.—The old bell-striking machine was replaced. The fifth-order lens was replaced by a fourth-order lens, with improved revolving apparatus. The position of the boat davits was changed from the front of the tower foundation to the head of the pier. On May 15, 1899, the white tower at this station had a horizontal brown band painted around it about midway of its height.

220. New London Harbor, Connecticut.—The old fog-signal house was converted into an oil house.

—. *Black Ledge, New London Harbor, Long Island Sound, Connecticut.*—The following recommendation, which was made in seven recent annual reports of the Board, is renewed:

> The necessity for establishing a light and an efficient fog-signal in such a position as to enable vessels to enter and leave the harbor of New London, Conn., has become evident, and especially so for the aid of those approaching from seaward.
>
> The numerous outlying shoals and ledges surrounding the entrance to this harbor make the approach to it dangerous in thick weather. The location of the present New London light and fog-signal station is so far inside the obstructions as to be partially ineffective as an aid for the purpose of safe navigation of this entrance. The commerce of the port of New London has so increased since the erection of the present light as to change the conditions materially. In view of these facts and the further fact that a naval station is in operation on the Thames River, which empties into New London Harbor, it is suggested that a light and fog-signal station be established on the southwest ledge on the eastern side of the entrance to New London Harbor. Estimate is made that it can be done for $45,000. It is therefore recommended that an appropriation of that amount be made therefor.

241. Little Gull Island, entrance to Long Island Sound, New York.—Under contract 1,015 tons of riprap were furnished and placed for the protection of the site. The two 13-horsepower oil engines for the improved fog-signal were received.

244. Orient Point, Long Island Sound, New York.—By act approved March 3, 1899, an appropriation of $3,000 in addition to the $30,000 appropriated by act of June 4, 1897, was made for the completion of this station. Contracts were made for the metal work and for the erection of the structure. On October 10, 1898, 48 plates, two lower courses of the foundation cylinder were delivered, and the work of erection was begun. On October 26, the second course of plates had been sunk in position when a gale swept them away, breaking 20 beyond repair and damaging 19 others. On April 20, 1899, the iron cylinder plates to replace those broken in the gale were delivered and the work of erection was resumed. On May 31, 1899, the foundation bed was completed ready to receive the cylinder plates. On June 1, 1899, the first course of cylinder plates was erected and the concrete filling was begun. On June 13, 1899, the second course of cylinder plates was erected. On June 30, 1899, the third course of cylinder plates was erected, but not entirely bolted together; the concrete filling was completed to within 3 feet of the top of the second course of cylinder plates. The entire metal work of the superstructure was delivered on July 4, 1899.

245. Long Beach Bar, Long Island Sound, New York.—The fog-bell striking machine was disabled by a falling weight, and the signal was discontinued March 18, 1899. A new striking machine was substituted and the sounding of the signal was resumed on June 22, 1899.

246. Cedar Island, entrance to Sag Harbor, Long Island Sound, New York.—A set of fifth-order lamps was furnished and fitted. Various repairs were made.

248. Saybrook Breakwater, mouth of Connecticut River, Connecticut.—The striking machine was replaced and the fourth-order lens of 360 degrees was replaced by one of 270 degrees.

289. Duck Island Breakwater, Long Island Sound, Connecticut.—The two vertical red lights were prepared for shipment and erection.

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292. Southwest Ledge, entrance to New Haven Harbor, Long Island Sound, Connecticut.—The sounding of the Daboll trumpet signal was discontinued on May 20, 1898, and was resumed September 15, 1898.

293. New Haven Middle Breakwater (E. end) beacon, New Haven Harbor, Long Island Sound, Connecticut.—A fixed white lantern light on a black pole with white top on easterly end, and a fixed red lantern light on a red pole with white top on the westerly end of the breakwater were established on June 28, 1899.

295. New Haven Outer Breakwater, Long Island Sound, Connecticut.—Appropriations were made for building this light-house of $25,000 by act approved June 4, 1897, and of $50,000 by act approved July 1, 1898. On September 1, 1898, contract was made for the metal work. Contract was made November 9, 1898, for the erection of the structure. On April 29, 1899, the caisson was completed and launched. On June 3 the placing of the concrete was begun. On June 11 the caisson was sunk into position, and on June 30 it was properly placed. On June 30 the foundation cylinder, except the upper or bell course, was placed in proper position and filled with concrete to the top of the fourth course of plates. Proposals were invited for furnishing and placing 2,000 tons of riprap for a protection to the site.

298. Housatonic River Breakwater beacon, mouth of Housatonic River, Long Island Sound, Connecticut.—The red lantern light authorized October 19, 1898, was prepared for shipment and erection.

299. Stratford Point, Long Island Sound, Connecticut.—On May 15, 1899, the white tower at this station had a horizontal brown band painted around it about midway of its height.

305. Bridgeport Breakwater, Long Island Sound, Connecticut.—The new fog-signal apparatus, consisting of a bell struck by electric machinery, a single blow about every thirty seconds, established July 28, 1898, having been found inefficient and unreliable, was discontinued October 5, 1898, and replaced March 15, 1899, by a fog-bell signal, consisting of a bell, about 160 pounds, and a 10,000-blow machine, striking a single blow every eight seconds. Various repairs were made.

306. Black Rock, Long Island Sound, Connecticut.—A set of improved fifth-order lamps was furnished and fitted to lens.

307. Penfield Reef, entrance to Bridgeport Harbor, Long Island Sound, Connecticut.—Two 3½-horsepower oil engines were substituted for the old caloric engines. Pending the installation of the oil engines, the trumpet signal was discontinued from October 7, 1898, to November 17, 1898, and under contract 500 tons of riprap were furnished and placed and about 200 tons of the old riprap were replaced for the protection of the foundation. Various repairs were made.

—. *Norwalk Harbor, Long Island Sound, Connecticut.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> It is also proposed to establish a light and fog-signal station on Pecks Ledge, Norwalk Harbor. It is estimated that this can be done for a sum not exceeding $10,000, and it is recommended that an appropriation of this amount be made therefor.
>
> It is also proposed to establish a light on Long Beach Day Beacon, Norwalk Harbor. It is estimated that this work can be done for $2,500, and it is recommended that an appropriation of this amount be made therefor.

308, 309, 310, 311. Norwalk Harbor lighted beacons, Long Island Sound, Connecticut.—By act approved March 3, 1899, an appropriation of $600 was made for establishing in Norwalk Harbor and River a white lantern light at Round Beach, a white lantern light at the bend in the river opposite Fitchs Point, a white lantern light at White Rock, and a red lantern light at Grassy Hammock Rocks. Preliminary surveys of sites for these lights were made.

313. Greens Ledge light and fog-signal, Norwalk Harbor, Long Island Sound, Connecticut.—By act approved March 3, 1899, an appropriation of $60,000 was made for establishing a light and fog-signal at this place. A preliminary survey of the site was made.

324. Execution Rocks, Long Island Sound, New York.—Some 500 tons of riprap were furnished and placed by contract for a protection to the site. On May 15, 1899, the white tower was changed by painting a horizontal brown band around and about midway of its height.

325. Sands Point, Long Island Sound, New York.—Some 254 feet of wire ribbon fence was built, and about 120 feet of board and 160 feet of picket fence were repaired.

326. Hart Island fog-signal, Long Island Sound, New York.—By act approved July 1, 1898, an appropriation of $2,500 was made for establishing a fog-signal station on the southern end of the island. A survey of the site was made. Efforts are being made to obtain a cession of jurisdiction and title to the site.

327. Stepping Stones, Long Island Sound, New York.—Some 300 tons of riprap were furnished and placed for a protection to the site.

328. Throgs Neck, Long Island Sound, New York.—Authority was granted to the War Department to extend the embankment for a battery about 6 feet into the light-house reservation on the south side.

339. Shinnecock Bay, Long Island, seacoast of New York.—A telephone connection with Shinnecock Bay life-saving station was established by 1 mile of submarine cable laid across Shinnecock Bay, supplemented by bare copper wire on poles. In December, 1898, connection was broken, cable spliced, and connection reestablished. Various repairs were made.

——. *Fire Island Inlet, Long Island, seacoast of New York.*—The following recommendation made in the Board's annual report is renewed:

> The entrance to Fire Island Inlet from the ocean is unstable, and the position across the bar shifts from time to time, and is liable, also, to sudden changes of position from the action of storms. The Board is of opinion that range lights should be established here to mark the channel. It is estimated that this can be done for not exceeding $500, and it is recommended that an appropriation of that amount be made therefor.

344. Canarsie Dike beacon, Jamaica Bay, New York.—This beacon, a fixed red lantern on a red post on the north dike, 31 feet from its extreme southeasterly end, was established on July 1, 1899.

347, 348. Navesink, seacoast of New Jersey.—The fixed white light in the north tower was discontinued on September 15, 1898, but is held in reserve for exhibition in the event of the accidental extinguishing of the electric light in the south tower. Extension to the south tower lantern was completed and a turn and test table for the electric lamps was fitted. The additional cistern was completed and the water-cooling plant for the oil engines was finished. Overflow pipes were fitted. After the establishment of the electric flash light in the south tower many complaints were made by the residents of the neighborhood of great discomfort and annoyance caused by the brilliancy of the flash. To obviate this trouble as far as possible panels Nos. 14, 15, and 16 of the lantern were darkened.

358. Sandy Hook (rear), entrance to New York Bay, New Jersey.—A plank walk 600 feet long was laid to connect the assistant keeper's dwelling with the main pathway, the cistern received a new cover, both engines were rebored, and the valves were faced. The reboring of the engines has had the effect of saving about 100 tons of coal in twelve months.

359. South Hook beacon (front) range, entrance to New York Bay, New Jersey.—This light was discontinued, as a war measure, on April 28, 1898, and relighted on August 1, 1898.

360. North Hook beacon, entrance to New York Bay, New Jersey.—As a war measure, this light was discontinued April 28, 1898. It was relighted August 1, 1898.

362. Point Comfort beacon, New York lower bay, New Jersey.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898.

366. Conover beacon, New York lower bay, New Jersey.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898.

367. Chapel Hill beacon, New York lower bay, New Jersey.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898.

368. Old Orchard Shoal, New York lower bay, New York.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898. Various repairs were made.

369. Romer Shoal, New York lower bay, New York.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898. The removal of the old and the erection of the new iron tower under contract was completed on September 14, 1898. A fourth-order lens light, flashing white every four seconds, was established on October 1, 1898. A fog-signal, consisting of a 1,300-pound bell, striking one blow every thirty seconds, was established February 20, 1899. Work was begun on the landing pier on October 8, 1898, and on December 17 the work was suspended for more favorable weather. Concrete in bags, to a depth of 3 feet, was laid for the outer end of the foundation, and cement 1 foot deep, 10 feet wide, and 20 feet long was placed on top of the bags and riprap, and a cofferdam 13 feet long and 10 feet wide was erected and filled with concrete to high-water mark. Under contract, 600 tons of riprap were furnished and placed for a protection to the station. Various repairs were made.

370. West Bank, lower bay, New York.—By act approved June 4, 1897, an appropriation of $50,000 was made for the establishment of a light and fog-signal station at this point. The exact location has not yet been determined.

371. Elm Tree, New York Bay, New York.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898. Minor repairs were made.

372. New Dorp, New York Bay, New York.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898.

376. Coney Island, New York Bay, New York.—The tower was painted. The characteristic of the light was changed on June 30, 1899, from flashing red every ten seconds to flashing red every five seconds. Various repairs were made.

377. Fort Tompkins, New York Bay, New York.—This light was discontinued, as a war measure, on April 28, 1898, and was relighted on August 1, 1898. Owing to the construction of batteries, it was necessary to give part of the reservation to the War Department and to allow the War Department to move the stable, wagon shed, etc., to another part of the reservation.

—. *Fort Wadsworth light and fog-signal station, New York.*—The Board in its annual report for 1892, page 68, made the following statement:

> The light at Fort Tompkins at present is well back of the point it is intended to mark. It is therefore proposed to move it from there to an angle of the stone fort at Fort Wadsworth, where it will better serve as a mark to the channel leading directly into New York Harbor.

The Board in its annual report for 1895, page 64, and in its three preceding annual reports, made the following recommendation:

> The light at Fort Tompkins at present is well back of the point it is intended to mark. It is therefore proposed to remove it from there to an angle of the stone fort at Fort Wadsworth, where it will better serve as a mark to the channel leading directly into New York Harbor. A fog-signal at Fort Wadsworth would be of especial service to the large commerce going through the Narrows during thick weather. The fog-bell at Fort Lafayette is serviceable to vessels bound to Coney Island, but it is too distant to be of much use to vessels using the other and more frequented side of the channel. The change will make it necessary to build a lantern and watch room on the salient of the fort and to place a fog-signal house and apparatus at the foot of the wall. It is estimated that these changes can be made for not exceeding $1,500, and it is recommended that an appropriation of this amount be made therefor.
>
> A battery for five high-power modern rifles is about to be completed and armed directly in the rear of the light-house. This fact makes it more important than before that this light should be removed.

An appropriation of $1,500 was made for moving the light to and establishing it and a fog-signal at Fort Wadsworth by act approved June 11, 1896.

The Board in its annual report for 1897, page 62, stated:

> An appropriation of $1,500 was made by the act approved June 11, 1896, for the removal of this light to the stone fort known as Fort Wadsworth and for the establishment of a fog-signal. As the amount appropriated is not sufficient to carry out the contemplated work, it has been decided to defer the removal of the tower, and to ask authority of the War Department to establish a temporary fog-bell on or near the sea wall outside the stone fort.

The consent of the War Department having been obtained, a fog bell with striking apparatus was established May 16, 1898, on the easterly angle of the sea wall at Fort Wadsworth, and a balance of $696.34 was left of the $1,500 appropriated.

The contiguous site for the light-house buildings, which had been selected with the consent of the War Department before the war with Spain, it was now ascertained, could not be had, as its use would interfere with the existing plans for defense, so a new site had to be found. One was finally selected with the consent of the War Department, but it was so far back that the buildings could not be moved from the old site and reerected on the new site except at much larger expense than had been originally proposed. It is now estimated that to move the light-house buildings from Fort Tompkins and to erect them at Fort Wadsworth on the newly selected site will cost, in addition to the $696.34 available, about $10,200 more. The Board therefore recommends that an appropriation of $10,200 be made, in addition to the balance of $696.34, for the purpose mentioned.

—. *The Battery, New York Harbor, New York.*—The following recommendation, made in the Board's last two annual reports, is renewed:

> There is no bell, whistle, or other fog-signal between the South Ferry on the East River and the Liberty Street Ferry on the Hudson (or North) River. The large num-

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ber of towing and other steamers navigating New York Harbor and trying to around the Battery, when, as they often are, caught in a dense fog, are in extr hazard, especially as the bell on Governors Island can be heard only during a so erly wind. The owners and representatives of the steam vessels state that the es lishment of a fog-signal at the Battery would give a greater degree of safety tha possible at present. The establishment of such a fog-signal, it is estimated, w cost not exceeding $3,600, and it is recommended that an appropriation of this am be made therefor.

383. United States Dike beacon, No. 1, Shrewsbury River, New Jerse This beacon was destroyed by ice on March 1, 1899, and was reest lished on June 1, 1899.

385. Island Beach beacon, No. 5, Shrewsbury River, New Jerse This beacon, which was destroyed by ice on March 1, 1899, was disc tinued, as it was not required.

386. Lower Rocky Point beacon, No. 2, Shrewsbury River, New Jersey This beacon was destroyed by ice on March 1, 1899, and was reest lished on June 27, 1899.

388. Little Silver beacon, No. 9, Shrewsbury River, New Jersey.—T beacon was destroyed by ice on March 1, 1899, and was reestablish on June 27, 1899.

399. Jeffreys Hook post light, Hudson River, New York.—Permissi has been obtained from the department of public parks of New Yo City to occupy the necessary site for a fog-signal and a more power light, which are urgently needed at this point. The estimated cost establishing the proposed light and fog-signal is $1,400.

The following recommendation, which was made in the Board's la four annual reports, is renewed:

> A larger light and a fog bell here would be valuable aids to navigation. The poi extends well out into the river, with deep water close to its outer end. The usu route of steamers passing up or down the river is close to the point. The prese post light should be replaced by a new structure, upon which should be the lante with the bell below.
>
> It is estimated that these can be established for not exceeding $1,400, and it recommended that an appropriation of this amount be made therefor.

403. Iona Island, Hudson River, New York.—The following reco mendation, made in the Board's last three annual reports, is renewed

> The post light at this station is of no service during thick weather. A fog-sign is needed during fog, in addition to the light, by the important commerce of th river. It is estimated that a fog-signal can be established here for a sum not exceed ing $1,200, and it is recommended that an appropriation of this amount be mad therefor.

407. Esopus Island, Hudson River, New York.—The following recom mendation, made in the Board's last three annual reports, is renewed:

> A post light is now maintained at this point, but a fog-signal is required in addition, during thick weather, by the important commerce of this river. It is estimated that a proper fog-signal can be established here for a sum not exceeding $1,200, and it is recommended that an appropriation of this amount be made therefor.

This island is near the center of the channel, has outlying rocks several hundred feet from its northern end, and the river at this point is noted for its fogs.

414. Saugerties, Hudson River, New York.—The boathouse was moved from the rear to the front of the pier, a new fence was built around the pier platform, and two gates were built. Various repairs were made.

420. Hudson City light-station, Hudson River, New York.—A boat landing was built and minor repairs were made.

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430. Sand Spit, Hudson River, New York.—A new pile foundation was built.

7. Point aux Roches, Lake Champlain, New York.—The tower deck and coping were repainted inside and out.

20. Split Rock, Lake Champlain, New York.—The work of raising, repairing, or rebuilding the dwelling, under contract, was begun on July 26, and completed on December 6, 1898. Various repairs were made.

WHITEHALL NARROWS BEACONS.

The repairs were confined mainly to keeping these aids to navigation efficient and making improvements to existing aids.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

176. Sakonnet, R. I.
180. Fort Adams fog-signal, R. I.
181. Lime Rock, R. I.
182. Newport Harbor, R. I.
183. Rose Island, R. I.
185. Gould Island, R. I.
186. Prudence Island, R. I.
188. Hog Island Shoal light-vessel No. 12, R. I.
189. Muscle Bed Shoals, R. I.
190. Bristol Ferry, R. I.
191. Borden Flats, Mass.
192. Whale Rock, R. I.
193. Dutch Island, R. I.
195. Wickford Harbor, R. I.
196. Conanicut Island, R. I.
198. Warwick, R. I.
208. Block Island Breakwater (front), R. I.
213. Watch Hill, R. I.
214. Montauk Point, N. Y.
218. Morgan Point, Conn.
219. North Dumpling, N. Y.
—. New London buoy and coal wharf, Conn.
240. Race Rock, N. Y.
247. Greenport Harbor beacon, N. Y.
249. Saybrook Point, Conn.
288. Horton Point, N. Y.
290. Falkner Island, Conn.
300. Stratford Shoal Middle Ground, N. Y.
301. Port Jefferson East Breakwater beacon, N. Y.
303. Old Field Point, N. Y.
304. Bridgeport Harbor, Conn.
312. Norwalk Islands, Conn.
314. Eatons Neck, N. Y.
315. Lloyd Harbor, N. Y.
316. Cold Spring Harbor, N. Y.
317. Stamford Harbor, Conn.
320. Great Captain Island, N. Y.
321. Jones Rock beacon, Conn.
333. North Brother Island, N. Y.
337. Hell Gate post light, N. Y.
341. Fire Island, N. Y.
—. Sandy Hook electric buoy station, N. J.
361. Sandy Hook fog bell, N. J.
363. Waackaack beacons, N. J.
378. Fort Wadsworth fog-signal, N. Y.
380. Robbins Reef, N. Y.
381. Liberty Enlightening the World, N. Y.
382. Governors Island post light, N. Y.
390. Princess Bay, N. Y.
391. Great Beds, N. Y. and N. J.
395. Bergen Point, N. J.
397. Passaic, N. J.
400. Tarrytown, Hudson River, N. Y.
401. Rockland Lake, Hudson River, N. Y.
402. Stony Point, Hudson River, N. Y.
405. West Point, N. Y.
408. Esopus Meadows, N. Y.
409. Rondout, N. Y.
423. Four-Mile Point, N. Y.
428. Coxsackie, N. Y.
429. Stuyvesant, N. Y.
1. Maxfield Point, Vt.
4. Windmill Point, Vt.
6. Isle La Motte, N. Y.
10. Cumberland Head, N. Y.
14. Bluff Point, N. Y.
15. Colchester Reef, N. Y.
19. Juniper Island, Vt.,
22. Barber Point, N. Y.
23. Crown Point, N. Y.

LIGHT-VESSELS.

177. Brenton Reef light-vessel No. 39, entrance to Narragansett Bay, Rhode Island.—This wooden vessel was built in 1875, is of 387 tons burden, and has a steam fog signal. She was supplied with lamps, fire brick, and life-preservers.

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188. Hog Island light-vessel No. 12, Narragansett Bay, Rhode Island.—This wooden vessel was built in 1846, is of 150 tons burden, and has a bell for a fog-signal. Slightly injured by collision, she was withdrawn from her station for repairs December 2, 1898, and returned next day. She is an old and worn-out vessel, fit for nothing but her present service of marking the station until the light-house and fog-signal authorized by Congress March 3, 1899, shall take her place. She was furnished during the year with medicines, crockery, sheathing metal, and ship chandlery.

217. Ram Island Reef light-vessel No. 23, Fishers Island Sound, New York.—This wooden vessel was built in 1857, is of 186 tons burden, and has a bell for a fog-signal. She will receive a new hawse pipe and oaken cheeks on mastheads for sheaves of lantern chain. She was supplied with cooking utensils, mast hoops, chimneys, and ship chandlery.

239. Bartlett Reef light-vessel No. 13, off New London, Long Island Sound, Connecticut.—This wooden light-vessel was built in 1854, is of 155 tons burden, and has a bell for a fog-signal. She was carried from her moorings by ice on February 24, 1899, and was returned to her station the same day by the tender *Cactus*, which had sought and found her adrift. She was taken off for repairs on May 31, 1899, replaced by relief light-vessel No. 20, and was returned to her station on June 20, 1899. Her repairs consisted of sheathing metal to replace sheets torn off by ice during the spring and a new gripe for the stem. She received during the year fire brick and grate, cooking utensils, chimneys, and ship chandlery.

287. Cornfield Point light-vessel No. 48, off the mouth of the Connecticut River, Long Island Sound, Connecticut.—This composite light-vessel was built in 1890–91, is of 295 tons burden, and has a steam whistle for a fog-signal and a flashing white light (revolving lantern) at the foremast. The light at the mainmast is fixed red. After having been repaired she was returned to her station on August 2, 1898. On August 29 her revolving apparatus was so disabled by collision that a fixed white light was shown from the foremast head. On September 1 she was withdrawn for general repairs, and was put back on her station on October 12. On February 21, 1899, she was carried from her station by ice, and was returned to it three days later by the tender *Cactus*. She received life-preservers, tools, rope, fuel, rations, oars, chimneys, and safety valves.

NOTE.—This light-vessel was withdrawn for repairs on June 21, 1899, and was returned to her station on July 15, 1899.

340. Fire Island light-vessel No. 68, off Fire Island, Atlantic coast of Long Island, New York.—This steam, steel light-vessel was built in 1897 and is of about 450 tons burden. She shows a fixed white incandescent electric light from each masthead. Her fog-signal is a 12-inch steam chime whistle. The electric plant which operates her lights and whistle works smoothly and well. The presence of this vessel near a coast where before her establishment wrecks had been of frequent occurrence continues to give satisfaction. She received medicines, canvas, brooms, brushes, and ship chandlery.

345. Sandy Hook light-vessel No. 51, off the entrance to New York.—This steel, steam, self-propelling light-vessel was built in 1892 and is of 283 tons burden. She was withdrawn for repairs on July 12 and returned to her station on October 13, 1898. She was again brought in on May 15, 1899, and is now under repairs. She is receiving new electrical engines, renovation in parts of the hull, boilers and machinery, calking and painting throughout. She was supplied with cordage, oil, putty, and paint.

346. Scotland light-vessel No. 7, off Sandy Hook, entrance to New York Bay, New York.—This wooden light-vessel was built in 1854, is of 142 tons burden, old measurement, and has a bell for a fog-signal. There is a leak of long standing amidships near the water line. She will be brought in soon to have it stopped and to have her sheathing metal repaired. She received a life buoy, cordage, paint, ship chandlery, and spars.

Relief light-vessel No. 16, kept in reserve at the light-house depot at Staten Island, New York.—This wooden light-vessel was built in 1854, is of 250 tons burden, and has a steam fog-signal. She is kept ready to relieve either light-vessel No. 51 off Sandy Hook, or light-vessel No. 68 off Fire Island. She replaced light-vessel No. 51 at Sandy Hook from July 12 to October 13, 1898. In April, 1899, she was sent to the Fifth light-house district, where she was placed on the Cape Charles light-station. On June 30, 1899, she was sent to the Fourth light-house district.

Relief light-vessel No. 19.—This wooden vessel is kept at the New London light-house depot. She was built in 1845; is of 150 tons burden, and has a bell for a fog-signal. She has been off duty for several years, and is virtually condemned, as she is not worth repair.

Relief light-vessel No. 20.—This wooden vessel was built in 1867, is of 165 tons burden, and has a bell for a fog-signal. She is kept at the New London light-house depot to relieve light-vessels in Long Island Sound. She is now on duty at the Cornfield Point light-vessel station, where, on June 21, 1899, she replaced light-vessel No. 48, brought in for repairs. At the close of the last fiscal year she was doing duty at the same station until relieved on August 2, 1898. She returned to that station again from September 1 to October 12, 1898, while light-vessel No. 48 was undergoing general repairs, and she was there again from February 21 to February 24, 1899, while repairs were being made to the revolving apparatus of light-vessel No. 48 which had been damaged by collision.

Relief light-vessel No. 11, at the general light-house depot.—This wooden vessel was built in 1853, is of 320 tons burden, and has a bell for a fog-signal. She was taken from permanent service in the fall of 1897, having served for thirty years on the Brenton Reef light-vessel station, and was thoroughly repaired. Her repairs embraced renovation in parts, of bulwarks, houses, hawse pipes, davits, pumps, and booms; a new suit of metal sheathing and painting throughout.

DAY OR UNLIGHTED BEACONS.

No repairs were made to these beacons during this fiscal year.

FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

177. Brenton Reef light-vessel No. 39, Rhode Island.—The two steam whistles, 6-inch and 12-inch, were in operation about 586 hours, and consumed some 74 tons of coal.

178. Beavertail, Rhode Island.—The 10-inch whistle, in duplicate, with Crosby automatic signals, was in operation about 724 hours, and consumed some 55 tons of coal.

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206. Point Judith, Rhode Island.—The first-class siren, in duplic was in operation 738 hours, and consumed some 64 tons of coal.

210. Block Island (SE.), Rhode Island.—The first-class steam siren, duplicate, was in operation about 1,003 hours, and consumed some tons of coal.

211. Great Salt Pond Breakwater (outer end) beacon, Rhode Island.— The blower siren, worked by a 2½-horsepower oil engine, was in opera tion about 190 hours, and consumed 50 gallons of oil.

214. Montauk Point, New York.—The first-class siren, in duplicat operated by 10-horsepower oil engines and compressed air, was i operation about 595 hours and consumed some 975 gallons of oil.

220. New London Harbor, Connecticut.—The first-class Daboll trum- pet, worked by 3½-horsepower oil engine, in duplicate, and compress air, was in operation about 729 hours and consumed some 303 gallo of oil.

240. Race Rock, New York.—The second-class siren, worked by 7-horsepower oil engine and compressed air, was in operation about 5 hours and consumed some 690 gallons of oil.

241. Little Gull Island, New York.—The second-class steam siren in duplicate was in operation about 695 hours and consumed some 40 tons of coal.

287. Cornfield Point light-vessel No. 48, Connecticut.—The 12-inch steam whistle was in operation about 514 hours and consumed some 120 tons of coal.

290. Faulkner Island, Connecticut.—The 10-inch steam whistle in duplicate was in operation about 509 hours and consumed some 40 tons of coal.

292. Southwest Ledge, Connecticut.—The second-class Daboll trumpet, worked by a 3½-horsepower oil engine in duplicate and compressed air, was discontinued from May 20 to September 15, 1898; since the latter date it has been in operation some 213 hours and consumed about 107 gallons of oil.

300. Stratford Shoal (Middle Ground), New York.—The second-class Daboll trumpet, worked by 3½-horsepower oil engines in duplicate, was in operation some 401 hours and consumed about 216 gallons of oil.

307. Penfield Reef, Connecticut.—The second-class Daboll trumpet, worked by Rider hot-air engine in duplicate until October 7, 1898, was in operation some 69 hours and consumed about half a ton of coal. It is worked by 3½-horsepower oil engines in duplicate since November 7, 1898, and was in operation about 310 hours and consumed some 126 gallons of oil.

314. Eaton's Neck, New York.—The second-class steam siren in duplicate was in operation about 628 hours and consumed some 40 tons of coal.

320. Great Captain Island, New York.—The 10-inch steam whistle in duplicate, with Crosby automatic signal, was in operation about 537 hours and consumed some 46 tons of coal.

324. Execution Rocks, New York.—The first-class automatic steam siren in duplicate was in operation about 342½ hours and consumed some 53 tons of coal.

340. Fire Island light-vessel No. 58, New York.—The 12-inch steam-chime whistle was in operation about 641 hours and consumed some 115 tons of coal.

345. Sandy Hook light vessel No. 51, New York.—The 12-inch steam whistle was in operation about 481 hours and consumed some 99 tons of coal.

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360. North Hook beacon, Sandy Hook, New Jersey.—The first-class automatic steam siren in duplicate was in operation about 941 hours and consumed some 61 tons of coal.

368. Old Orchard Shoal, New York.—The blower siren, worked by a 3½-horsepower oil engine, was in operation about 782 hours and consumed some 376 gallons of oil.

380. Robbins Reef, New York Harbor.—The blower siren, worked by a 3½-horsepower oil engine, was in operation about 336 hours and consumed some 137 gallons of oil.

BUOYAGE.

The winter of 1898–99 was quite severe. Fields of heavy ice for weeks remained together in almost continuous flow. The tenders were kept constantly at work replacing buoys and repairing the cables of the electric buoys in New York Lower Bay until November 29, 1898, when they commenced to remove for the winter all the iron buoys in the district except a few of the more important and the bell buoys, and they were not again replaced until March 1, 1899. The bell buoys were kept in place until February 13, when running ice made it necessary to remove them all with one exception. The number of buoys and appendages lost during the year was great, and would have been larger but for the activity of the tenders engaged in patrol duty. Buoys were placed for the first time in Basin Harbor, Block Island, Rhode Island, in Jamaica Bay, Long Island, New York, and in Sandy Hook Bay, New Jersey. Wreck buoys were established and afterwards discontinued in Long Island Sound, New York Upper and Lower Bays, and East River, New York. The buoys were removed which had marked safe channels through submarine-mine fields in the channels of the entrances to New York Harbor, New Haven Harbor, and Narragansett Bay. The quarantine buoys were discontinued which had been placed for transports in Fort Pond Bay, Montauk Point, New York. Buoys were placed for the use of the supervisors of anchorage and the harbor. A gas and bell buoy and an ice buoy were placed for experimental purposes near the general depot, and the former is still in place. A port-hand channel buoy, of the kind referred to, has been made for this depot, and will be placed for experiment next winter when the buoys are changed. The shape of this buoy is cylindrical for 5 feet on top and conical for about 15 feet 8½ inches on the remainder of its length. Above the water line it shows about as high as a second-class can buoy.

ELECTRIC BUOYS.

The suspension of the system of electric-lighted buoys in New York Lower Bay, begun in April, was terminated in August, and the exhibition of the lights was resumed on September 1, 1898. Its operation since then, when not interrupted by violent interference, has been perfect.

The lights were extinguished by various causes, as follows:

E 1.—Buoy water-soaked; new buoy furnished. Carbon broken by collision; new buoy furnished.

E 2.—Defect in transformer; new buoy furnished.

E 4.—Head burned off; water-soaked; new buoys furnished, and a new transformer.

E 5.—Cut off by ice; new buoy furnished.

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E 6.—Lamp broken by collision; buoy cut off by ice; at anot time water-soaked; new buoys and a transformer furnished.

E 7.—Head burned off; water-soaked; new buoys and a transfor furnished.

E 8.—Buoy cut off by collision; lamp broken; new buoy and tra former furnished.

B 2.—Head burned off twice; water-soaked; new buoys and tra former furnished.

No. 12.—Extinguished four nights by leaks in splices of cable, sixteen nights by floating ice, and two nights by collision.

Buoy C.—Extinguished sixteen nights by floating ice, four nights b leaks in cable, and once by collision; new buoy furnished.

All of the electric-lighted buoys were extinguished for causes and o dates as follows:

July, 1898.—The channel was closed, as a war expedient, during th entire month.

August, 1898.—All the lights in Gedney Channel were extinguishe for one hour, due to a short circuit of the cable. Buoy E 3 had its head burned off.

September, 1898.—The lights ran the entire month, except buoy C, the cable of which was removed September 14 to permit dredging of the channel in its vicinity. It was replaced by an oil lamp on a spar buoy.

October, 1898.—All the lights in Gedney Channel were extinguished October 7 and 24; buoys E 3 and E 8 were cut in two by passing vessels; October 27 and 28 the cable was damaged by collision.

November, 1898.—All the Gedney Channel lights were extinguished November 6; a collision caused the current to burn off the head of buoy E 7; November 17, for a short time, all the buoys were submerged by the easterly gale; November 26 the buoys were covered for four hours by high sea.

December, 1898.—A northeast gale submerged the buoys, chafed the cable through near buoy E 7, and rendered it impracticable to make repairs, and a passing vessel parted the cable between the junction box and the beach. In consequence, the red lights were out from December 4 to December 8, and the white lights from December 4 to December 10, 1898.

January, 1899.—All the lights were running during the month.

February, 1899.—Due in part to collision, but more directly to running ice, all the lights in Gedney Channel were extinguished between February 11 and February 23. Buoys C and No. 12 were in darkness from February 8 to February 26, the cable which lights them having been three times broken and dragged out of place by vessels. It had to be taken up for repairs and relaid.

March, 1899.—Owing to the cause known as "burned out," the lights in Gedney Channel were extinguished on March 2, 3, 20, and 21, and on March 29 and 30, by the parting of the cable near the junction box by a passing vessel.

May, 1899.—The lights were extinguished for a short time on May 3, due to the submergence by rough weather of buoy E 8.

NEW CABLE FURNISHED.

The collisions and ruptures by passing vessels caused a considerable expenditure of cable and required frequent attendance and service on

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the part of the tenders. A few of the more important instances are given:

About 100 feet of copper-armored cable was laid between the junction box and the beach to replace a section parted by a vessel.

About 5,280 feet of cable was laid to replace an entire stretch strained, abraded, or ruptured in several places by the impact of passing vessels.

About 150 feet of cable was spliced between buoys E 3 and E 5 to fill a breach caused by collision.

About 200 feet of cable near buoy B 2 was used to repair damage.

About 2,500 feet of iron-armored cable was used between buoy No. 12 and the beach to replace much of the circuit of direct-current cable, which had been broken and carried off.

On May 9 the cable between the junction box and buoy B 2 was taken up to permit dredging and relaid across the easterly end of Gedney Channel, thus forming the loop which was used to serve the lights until 1897, when it was replaced by a fork or terminal of two ends. This latter will be restored when the dredging has been completed.

Number of vessels using Gedney Channel, New York Lower Bay, between sunset and sunrise, in the fiscal year 1898-99.

Fiscal year and month.	Bound in.	Bound out.	Total.
1898.			
July	......	......	......
August	54	42	96
September	76	36	112
October	45	29	74
November	65	59	124
December	34	28	62
1899.			
January	81	54	135
February	29	22	51
March	52	25	77
April	42	27	69
May	54	31	85
June	67	19	86
Total	599	372	971
Average per month	54.5	33.8	88.3

Synopsis showing the number of vessels using Gedney Channel at night since the installation of the electric-buoy plant, November 7, 1888.

	Number of vessels.			Average per month.		
	Bound in.	Bound out.	Total.	Bound in.	Bound out.	Total.
1888-89 (seven months)	171	53	224	24.4	7.6	32
1889-90	377	192	569	31.4	16	47.4
1890-91	470	297	767	39.1	24.7	63.9
1891-92	533	252	785	44.4	21	65.4
1892-93 (ten months)	487	215	702	48.7	21.5	70.2
1893-94	648	347	995	54	28.9	82.9
1894-95	561	286	847	51	26	77
1895-96	542	238	780	45.1	19.9	65
1896-97	541	222	763	45.1	18.5	63.6
1897-98 (ten months)	545	235	780	54.5	23.5	78
1898-99 (eleven months)	599	372	971	54.5	33.8	88.8

The increase of traffic in and out during open navigation has steadily increased since 1897.

Third District.

DEPOTS.

Tompkinsville, Staten Island, N. Y.—This is the general depot for Light-House Establishment, as well as the principal depot for the Thi light-house district. The annual supplies of all kinds for light-hous light-vessels, light-house tenders, and day beacons, and buoys an appendages for the entire service are purchased by contract on exp specifications and uniform standards, and are assembled at this depot an prepared for distribution by the supply steamer *Armeria* to the statio on the Atlantic and Gulf coasts and by the various freight lines radi ing from the vicinity of New York City. The supplies thus collect embrace oils, wicks, and chimneys, cleaning materials and fabrics, too implements, ship chandlery, engineer's stores, and the like, which a tested before acceptance. On the depot grounds are stored and car for, ready for use or shipment, electric, gas, whistling, bell, can, nu and spar buoys, sinkers, ballast balls, anchors, chains, and necessary ground tackle. In the stores are materials and supplies, where they are kept ready for service. The laboratory and the testing rooms in the lamp shop are used not only for experimental work with lenses, lamps, fog-signals, clockwork, and other apparatus, but for testing oils, wicks, chimneys, and general supplies. The vessels of the district are repaired when practicable by the mechanics employed at the depot. The fire department of the depot is fully organized and equipped. It is composed of all the workmen of the depot and the crews of light-house vessels lying at the wharves. The men are assigned to stations and frequently drilled for service by day or night. The power house, electric-lighting plant, fire engines, and gear generally are efficient and well kept. The work done in the light-house inspector's department embraces the receiving, storing, packing, and shipping supplies, buoys and appendages, anchors, chains, ship chandlery, rations, and fuel; loading and unloading the supply vessel and tenders of the Third and adjacent districts; testing oils, paints, wicks, chimneys, and stores of various kinds; repairing tenders and light-vessels; making and repairing boats, sails, awnings, etc.; repairing iron buoys and appendages, and doing blacksmith work for all the vessels in the district and all the shops in the yard.

On the engineer's side is the importation, inspection, storage, preparation, and, in large part, the manufacture and assembling of illuminating and other light-house appliances, some parts of which are not made or not advantageously procurable in this country; the manufacture and the development of lamps and technical apparatus of many kinds; the constant endeavor, by tests and experiments, to improve the efficiency and reduce the cost of illuminating and fog-signal apparatus; the testing of engines and fog-signals and investigation of new illuminants and methods of illumination, and improvements in the design and application of light-house structures and materials; the preparation of plans and specifications for works of construction; the repairs of stations, fog-signals, etc., and the procurement and shipment of materials necessary therefor. The character, extent, and variety of this work may in a measure be inferred from the following brief outline summary of the work done under the engineer:

East face, north sea wall.—This work, according to the terms of the contract, should have been completed by June 30, 1898. Up to and including October 1, 1898, the cofferdam was built and excavated for its entire length to a depth of 10 feet; the north end as far as the first bulkhead, 55 feet by 12 feet, was pumped out to the required depth, and 68 cubic yards of concrete was placed in the bottom. Owing to the slow progress made, the frequent stoppage of the work entirely, and the apparent inability of the contractors to complete it, the contract was annulled on October 17, 1898, and the work was taken in hand on October 18 by the Government, and by December 17, when the contract was assumed by the bondsmen on contract, the following-named work had been done: The cofferdam was repaired and braced throughout; first section, 180 cubic yards, of concrete was placed and leveled to receive the concrete in bags, upon which the cut stone is to rest; second section, the water was pumped out and two courses 30 cubic yards of concrete in bags were placed to receive loose concrete, 60 feet in length of the cofferdam, with bulkhead 11 feet by 15 feet, covered to a depth of 15 feet with loose concrete on top of the bags; third section, 125 bags of concrete were placed to receive loose concrete, of which 30 cubic yards were placed. On April 5 the first cut stone of the wall was placed, and since that date good progress was made. On June 30, 1899, the sea wall, 198 feet long, was completed, except about 40 feet of its length. In all about 540 cubic yards of stone were placed. About 200 cubic yards remain to be done.

Continuation of east face, north seawall.—Work was begun under contract on April 8, and on June 30 the entire concrete filling of the cofferdam, 85 feet by 12 feet, 900 cubic yards, was completed and ready to receive the cut stonework.

East face wharf.—Contract was made on June 22, 1899, to do the required work.

Depot basin.—Under contract the basin was dredged to a mean depth of 14 feet at low water. About 17,555 cubic yards were dredged out. A new landing wharf and stage were built, and the coal wharf and runway were repaired.

In addition the general work of the depot was carried on, as follows: The receipt, preparation, care, and shipment of material, stores, etc., for the general work of this and the various districts; the repairs, alterations, etc., of the steamers, fog-signals, light-vessels and stations, and the machinery and apparatus pertaining thereto; the care and maintenance of the quarters, shops, buildings, fences, and grounds of the depot; the examination and test of illuminating apparatus from and for the various stations and districts, and from abroad; the preparation of new and the repair of old illuminating apparatus, clocks, revolving machinery, lanterns, lamps, burners, fog-signals, etc., for this and the other districts; the manufacture and repair of oil-supply cans and boxes; the setting up and testing of improved fog-signals, oil and gasoline engines, acetylene and other apparatus, and experiments in connection therewith; the preparation of plans, drawings, and estimates for works, and a large and varied amount of detail work that can not here be specified nor outlined.

Congress appropriated $25,000 by the act approved March 3, 1899, for continuing the improvements to the grounds and buildings, the construction of the sea wall, rebuilding wharves, and dredging the basin at the general light-house depot. It is estimated that $50,000 can be profitably expended for continuing the work during the fiscal year 1901, and the Board recommends that an appropriation of that amount be made therefor.

Third District.

The following tabular statements show in a condensed form the shipments and receipts at the depot and the articles manufactured during the year:

Statement of chain, buoys, and buoy appendages received at and shipped from the general light-house depot (inspector's department) during the fiscal year ending June 30, 1899.

Articles.	Received.	Shipped.	Total.
Gas buoys	17	19	36
Whistling buoys	2	7	9
Bell buoys	7	13	20
Can buoys	24	38	62
Nun buoys	23	60	83
Ice buoys	....	4	4
Spar buoys, wood	155	185	340
Ballast balls	50	50	100
Sinkers, iron and stone	167	268	435
Shackles and swivels	1,226	1,433	2,659
Shackle keys and rings	2,725	875	3,600
Ruby shades for gas buoys	1	1	2
Chain, buoy .... fathoms	5,476	5,950	11,426
Chain, light-vessel .... do	420	705	1,125
Mushroom anchors	24	11	35
Bells for buoys	21	13	34
Bells for light-vessels	2	2	4
Valves for whistling buoys	30	9	39
Rubber balls for valves of whistling buoys	6	1	7
Disks for bell buoys	23	18	41
Steel striking balls for bell buoys	12	15	27
Tubes and brackets for bell buoys	....	6	6
Bridal chains for bell buoys	11	8	19
Whistles for buoys	2	10	12

Statement of boxes, packages, etc., containing supplies received at and delivered from the general light-house depot, Staten Island (inspector's department), during the fiscal year ending June 30, 1899.

	Boxes.	Bundles.	Barrels and kegs.	Packages and coils.	Cans.	Total.
Received	15,281	1,919	10,397	7,822	69,784	105,203
Shipped	11,973	4,230	9,193	10,161	77,030	112,587
Total	27,254	6,149	19,590	17,983	146,814	217,790

Statement of quantity of mineral and lard oils received at and delivered from the general light-house depot, Staten Island (inspector's department), during the fiscal year ending June 30, 1899.

	Received, gallons.	Delivered, gallons.	Total, gallons.
Mineral oil	437,289	380,630	817,919
Lard oil	3,407	2,728	6,135
Total	440,696	383,358	824,054

List of boxes, barrels, bundles, cans, packages, etc., exclusive of lens apparatus, received at and delivered from light-house depot (engineer's department) from July 1, 1898, to June 30, 1899.

	Boxes.	Barrels.	Bales, bundles, coils, packages, etc.	Kegs.	Cans.	Total.
Received	931	728	8,111	118	29	9,917
Delivered	676	2,048	3,485	48	52	6,309
Total	1,607	2,776	11,596	166	81	16,226

Third District.

List of lens apparatus, etc., received at and shipped from general light-house depot, Staten Island, New York, by engineer Third light-house district, with number of cases in which received and shipped, from July 1, 1898, to June 30, 1899.

	Order number —						Lens lanterns, post lanterns, etc.	Total.
	1.	2.	3.	3½.	4.	5.		
Lens apparatus:								
Received	1	......	4	1	3	1	5	15
Delivered	......	......	1	1	10	4	154	170
Total	1	......	5	2	13	5	159	185
Cases:								
Received	26	......	46	2	9	5	14	102
Delivered	......	......	12	2	75	16	132	237
Total	26	......	58	4	84	21	146	339

List of articles manufactured and repaired in lamp shop at general light-house depot. Staten Island, New York, under direction of the engineer Third light-house district, during the year ending June 30, 1899.

	Lens lanterns.	Lamps.	Lamp burners.	Cans.	Miscellaneous.	Total.
Manufactured	244	340	145	15, 000	1, 752	17, 481
Repaired	18	28	13	2, 227	155	2, 441
Total	262	368	158	17, 227	1, 907	19, 922

New London, Conn.—The tender *Cactus* is stationed here, her duty being to serve the light-stations and attend to the buoys and beacons to the eastward of New Haven, Conn., but she is called to the general light-house depot in seasons of emergency for duty at the western end, and, in like manner, the tenders from this section are sent to the east. Most of the incidental supplies and some annual deliveries for the stations of the eastern part are stored here. These supplies include buoys and appendages, anchors, chain, lime, and fuel, as well as materials for construction and repairs. Relief light-vessels Nos. 19 and 20, with one keeper for both, are kept here in readiness for duty. The coal bin at the depot was repaired during the year.

Goat Island, Newport Harbor, Rhode Island.—The stations in Narragansett Bay and its immediate vicinity outside receive their fuel and lime from here, and the local floating aids their supply of buoys and appendages, anchors, and chains. The tenders, also, working at the eastern end of the district obtain from this depot the fuel which they need.

Juniper Island, Lake Champlain, Vermont.—The depot at this point consists of a storehouse for incidental supplies and boats and a commodious wharf for landing at the light-station, which it serves, and for keeping buoys. Building materials for the Light-House Service on Lake Champlain are here conveniently stored. The annual supplies furnished from the general light-house depot are distributed by the tender *Daisy*, in a special trip, via the Hudson River Canal, between Whitehall and Rouse Point, N. Y.

Third District.

SUPPLY STEAMER.

Armeria.—This steel screw steamer was built in 1889–90, and is of 634 tons burden. From May 6 to September 15, 1898, she was attached to the Navy as a supply ship. She was returned to the Light-House Service on September 16, 1898. Before going on her winter trip to supply lights she was overhauled. Her repair embraced a new dynamo, searchlight, and vapor launch, and a renewal of her outfit and equipment, all at a cost of $16,390.35, which was paid by the Navy Department. During the *Armeria's* trips in winter and spring she supplied the stations from Fire Island, New York, to Point Isabel, Texas. The supplies delivered consisted of 185,000 gallons of mineral oil; 200 tons of paints, oils, and turpentine; 3,000 boxes of chimneys and cleaning materials, and 8,000 packages of miscellaneous stores. In addition to her regular cargoes, she carried to the light-house depots of the different light-house districts 1,000 packages of incidental supplies, and placed buoys at remote stations and did other important buoy work in the Sixth and Eighth light-house districts. The inspector of the Eighth light-house district visited in the *Armeria* the stations in his district. She encountered in both trips more than ordinary rough weather and much fog, and these rendered extremely hazardous the landing of supplies at exposed stations, and particularly on the coast of Texas. During her two trips she steamed about 13,000 miles, consuming some 1,070 tons of coal. She received during the year hose pipe, crockery, medicines, electrical supplies, and engineer's stores.

TENDERS.

John Rodgers.—This iron side-wheel steamer was built in 1883 and is of 131 net tons burden. She was on duty during the year except for 42 days while under repair. She served on tours of inspection 22 days, visiting 122 stations, cleaned and painted 266 buoys, and placed or replaced 290 buoys. She worked on the electric cables in New York Lower Bay 34 days, changed the electric buoys 17 times, and renewed 15 electric lamps. She also delivered 900 tons of coal, 14 cords of wood, 3,870 gallons of oil, and 990 packages of supplies. She was engaged 9 days towing and changing light-vessels; she lighted and buoyed five wrecks, lighted lantern on detached electric buoy C nine times, moved the effects of four keepers, and transferred and made five shipments of freight to transportation lines. In doing this she steamed about 8,600 miles and consumed some 633 tons of coal. Her repairs in general consisted of going into dry dock, where her bottom was scraped and painted, her keel was patched, sponsons were replaced under the guards, new towing bitts were put in, the forward deck was calked and sheathed, tops and linings were put in her paddle boxes, and she received new smokestack. Furniture, tableware, cooking utensils, and engineer's stores were supplied.

Gardenia.—This wooden screw steamer, purchased in 1888, is of 83 tons burden. She was employed in supplying and inspecting lights, attending buoys, marking wrecks, and shipping freight, except for 32 days, when she was laid up for repair. She changed or replaced 384 buoys, painted 260 and recovered 15 buoys which had been detached by colliding vessels. She delivered 29,570 gallons of mineral oil, 2,914 packages of supplies, 595 tons of coal, 20 cords of wood, and 20 lots of rations to light-stations. She visited for inspection 30 stations, and

Third District.

made 13 shipments of freight to the lines of transportation in New York Harbor. The *Gardenia* supplied the Scotland light-vessel and the Romer Shoal light-station with water six times; repaired or renewed the lamps and cables of the electric buoys twelve times; spent 14 days in changing light-vessels, 2 days in towing tenders for repairs, and 2 days in moving transferred keepers; made 16 trips to have gas buoys filled, charged them on station eight times, and replaced them twelve times; marked four wrecks with lights and buoys, and was employed at the general depot for 40 days in filling coal, stowing chain, and painting buoys. She steamed about 10,400 miles and consumed some 434 tons of coal. Her hull was strengthened by a new garboard strake and another near it, and she received a new propeller. She was furnished with medicines, crockery, hose, ship chandlery, canvas, and oars.

Cactus.—This wooden side-wheel steamer was purchased as far back as 1865, and is of about 200 tons burden. She is mostly employed serving the stations and attending the buoys and beacons in the eastern section of the district, and has her headquarters at the New London light-house depot. She changed or replaced 262 buoys, painted 382, and recovered 16 buoys. She delivered 34 barrels of lime, 554 tons of coal, 49 cords of wood, 15,870 gallons of oil and annual supplies to the stations between New York City and Sakonnet Point, Rhode Island, rations to 68 stations, and 4,487 packages of incidental supplies. She inspected 97 lights, was under repair for 54 days, and worked 34 days in preparing light-ships for duty and placing them on stations, and in keeping in order the wharves, buildings, and property stored at the New London depot. She steamed some 9,976 miles, and consumed about 592 tons of coal. She received a crank pin and brasses, piston rod, and boxes; the shaft, valve, and piston of the steam steerer was renewed; the jacket of the steam chimney was refitted; patches were put on the boiler, and the furnaces and ash pans were rebuilt. She received during the year cooking utensils, hose, engineer's stores, cleansing materials, and paints.

Daisy.—This wooden screw steamer was purchased in 1892, and is of about 13 net tons burden. Her principal service, and for which she is particularly handy, is the shipment of freight, transportation, delivery of annual supplies on Lake Champlain, and incidental supplies in small quantities elsewhere, marking wrecks, patrol duty, towage, inspection, work at depot, and the like. She was employed 43 days on tours of inspection with the district officers; supplied the light-stations on Lake Champlain, going there via the Hudson River Canal; on duty for 2 days with the Chairman and the Secretary of the Light-House Board; delivered 8,950 gallons of oil, 1,159 packages of supplies, and 140 gallons of water; shipped 1,273 packages of freight to the various transportation lines; returned 1,682 empty oil cases to the depot; conveyed superintendent of construction and blacksmith 5 days for repairs to post lights; placed 11 and painted 212 buoys, and recovered 8 buoys with sinkers and shackles. She was at work of various kinds at the general light-house depot 33 days; determined the channel to Fort Lafayette, and marked it with buoys; sounded for wrecks; located wrecks in Newark Bay, New Jersey, and Gowanus Bay, New York; her crew attended fire drills at the light-house depot, and she was laid up 5½ days for repairs. The *Daisy* steamed about 3,068 miles, and consumed some 110 tons of coal. Casings for the pilot house and sash weights for windows were put in at the depot. Repairs were made to her boiler, engine, and condenser. She received

Third District.

paints, cleansing materials, ship chandlery, and bricks and grate for galley stove.

Mistletoe.—This wooden side-wheel steamer was built in 1872, and is of 332 tons burden. She was furnished during the year with the following named articles: New 22-foot cargo boat, 760-pound anchor, 200 feet of fire hose, wildcat for the windlass, and 100 feet of galvanized steering chain. A new gasket was fitted with floating top on the air pump, the boiler and stay bolts were calked, the gallows frame was set up, the engine was lined up, and the shafting, pumps, condenser, and anchor engine were overhauled. The guards, sponsons, and bulkheads in the paddle boxes were repaired, and the boat was painted by the crew and the depot force. Except while under repair she was engaged in her usual work of inspection, construction, repairs, and maintenance of the lights, signals, beacons, etc., and the freighting and the shipment of stores and material, in the performance of which duties she steamed during the year some 7,592 miles, with a consumption of about 431 tons of coal; an average of 1,002.91 pounds for each hour of steaming.

Rose.—This wooden screw steamer was built in 1873, and is of about 80 tons burden. Only such repairs were made as were absolutely necessary to enable her to perform the light duties assigned her within her restricted limits, i. e., Sands Point to and including the Narrows, New York Harbor, and these were made by her crew and the depot force. A new surface blow-off valve was fitted, three braces in the boiler were repaired, and the furnace bridge walls were braced; the crank-pin brasses were rebabbitted, the engines were lined up, and the guard rail was repaired. As her hull was so rotten and weak as to render her unfit for service, she was placed out of commission on April 30, 1899. Her boiler, engine, and machinery are in good condition and can be used in another vessel. The *Rose* was engaged in the general work of the district in connection with works of inspection, repairs, and construction, the freighting and shipment of stores and apparatus. She steamed some 3,742 miles during 538 hours, with a consumption of about 164 tons of coal; an average of 610.78 pounds for each hour of steaming.

Steam launch Nettle.—This wooden screw steam launch was built in 1878, and is of 18 tons burden. The following named articles were furnished and repairs were made to this vessel: A regulation fog-signal and side lights were furnished, a new four-blade propeller with accessories was put on, and eight tobin bronze holding-down bolts were furnished and fitted; iron bolts in the flange of the sea cock were replaced with composition bolts; an iron tiller was made and fitted; the boiler was overhauled, patched, and calked; the engine and shaft were lined up and repaired, etc.; the water-closet and pilot house were enlarged; additional berths were placed in the cabin; a bunk was built in engine room; railing was refitted; the galley was repaired; the hold was cleaned, and the vessel was painted throughout and prepared for the working season. During a part of September and the entire month of October, 1898, she was engaged in inspection and repair in the Hudson River, Whitehall Narrows, and Lake Champlain. The remainder of the year she was employed in similar work in New York Bay and adjacent waters, rendering excellent service, where a larger vessel could be neither economically nor advantageously employed, if at all. In the performance of these duties she has steamed some 2,863 miles during 541 hours, with a consumption of about 44 tons of coal; an average of about 161.9 pounds for each hour's steaming.

Third District.

The following statement made in the Board's last two annual reports is renewed:

> *Tender for inspector of the Third light-house district.*—The establishment of a light-vessel off Fire Island makes it imperative to provide a new tender for supply and inspection of ample size and strength for service in the Atlantic Ocean. Neither the tender *Gardenia* nor the tender *John Rodgers* is capable of taking the sea in rough weather outside of Sandy Hook. The *Gardenia* is a small wooden propeller of but 82 tons burden; she is 18 years old, and was purchased secondhand in 1887. The *John Rodgers* is an iron side-wheel vessel of 260 tons, which was built in 1883, and has been kept hard at work ever since. Both vessels are too old, too small, and too weak for the new duty devolved on the tenders by the establishment of a light-vessel station 35 miles east of Sandy Hook. The necessities of electric-light vessel No. 51 at Sandy Hook, added to the routine of other work, exact such frequent movement on the part of the tenders that this additional service should be temporary until a new vessel takes her place. The new vessel should be a composite screw steamer, of the latest design, swift and powerful, for service at sea, and fitted and equipped to carry every portable aid to navigation and to meet every demand of a service that will continue to expand. It is estimated that such a steamer could be built, fitted out, and made ready for service for, say, $95,000, and it is recommended that an appropriation of this amount be made therefor.

Tender for the engineer of the Third light-house district.—By act approved March 3, 1899, an appropriation of $85,000 was made for a new steam tender for construction and repairs in the Third light-house district. Plans and specifications for the vessel are in course of preparation.

FLOAT FOR GAS TANKS.

Since the establishment of a regular light-house at Romer Shoal, New York lower bay, the service of this vessel to convey gas tanks for filling the former automatic beacon has not been required. She will be kept in good condition, however, for such need of her as may arise.

FOURTH DISTRICT.

This district extends from a point on the coast of New Jersey opposi Shrewsbury Rocks (but does not include the rocks) to and includin Metomkin Inlet, Virginia. It embraces all aids to navigation on t seacoast of New Jersey, Delaware, Maryland, and Virginia, and th tidal waters tributary to the sea between the rocks and the inlet.

Inspector.—Lieut. Commander W. H. Reeder, United States Navy, to August 5, 1898; Lieut. Commander G. K. Haswell, United States Navy, to October 18, 1898; since then, Commander Adolph Marix, United States Navy.

Engineer.—Lieut. Col. William A. Jones, Corps of Engineers, United States Army.

In this district there are—

Light-houses and beacon lights, including 5 post lights	67
Light-vessels in position	5
Day or unlighted beacons	3
Fog-signals operated by steam, caloric, or oil engines	7
Fog-signals operated by clockwork	7
Gas-lighted buoys in position	2
Whistling buoys in position	3
Bell buoys in position	6
Ice buoys in position	37
Other buoys in position	141
Steamer *Zizania*, buoy tender, and for supply and inspection	1
Naphtha launch *Leal*, used for works of construction and repair	1

LIGHT-STATIONS.

447. *Sea Girt, seacoast of New Jersey.*—The grounds were covere with soil and seeded with lawn grass. A flagstaff was erected, a telephone installed, and a set of signal-code flags, etc., furnished. Variou repairs were made.

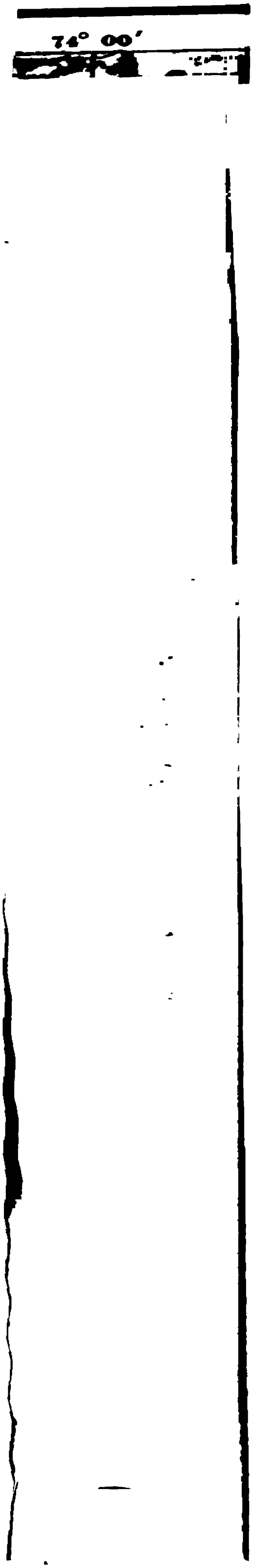
448. *Barnegat, seacoast of New Jersey.*—A flagstaff was erected, a telephone installed, and a set of signal-code flags, etc., furnished. Variou repairs were made.

450. *Absecon, Atlantic City, seacoast of New Jersey.*—New stone curb were set, new flagstone sidewalks laid, and the concrete boundary wal reset in accordance with recent city ordinances which changed the grade of the adjacent streets. A topographical survey of the station was made. Various repairs were made.

451. *Ludlam Beach, seacoast of New Jersey.*—The work of erecting a kitchen addition and making repairs to the light-house, of laying new drains and new walks was completed. A flagstaff was erected, a telephone installed, and a set of signal-code flags, etc., furnished. A contract was made for the construction of a concrete sea wall around the rear portion of the light-house lot. Various repairs were made.

452. *Hereford Inlet, seacoast of New Jersey.*—A flagstaff was erected, a telephone installed, and a set of signal-code flags, etc., furnished. Various repairs were made.

455. *Cape May, seacoast of New Jersey.*—A light horizontal staff was placed on the watch-room balcony of the tower, and a set of signal-code flags, etc., furnished. Various repairs were made.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Fourth District.

The following recommendation made in the Board's last three annual ports is renewed:

This is a first-order seacoast light, and three keepers are employed to attend it.
here are quarters for only two families, and the third keeper has to be accommo-
ted by makeshift arrangements which are thoroughly unsatisfactory and detri-
ental to the discipline and efficiency of the service. It is estimated that an
lditional keeper's dwelling can be built here at a cost not exceeding $4,000, and it
recommended that an appropriation of that amount be made therefor.

457. Cape Henlopen, Delaware Bay, Delaware.—A light horizontal taff was placed on the watch-room balcony of the tower, a telephone nstalled, and a set of signal-code flags, etc., furnished. Various epairs were made.

458. Delaware Breakwater (east end), Delaware Bay, Delaware.—The haracteristic of the fog-signal was changed so that the trumpet now ives a two-second blast every fifteen seconds instead of a three-second last every thirty seconds. Various repairs were made.

—. *Harbor of Refuge, Delaware Bay, Delaware.*—As the new national arbor of refuge is nearing completion, the Board considers that the nterests of commerce and navigation require the establishment of a ight and fog-signal with a keeper's dwelling on the new breakwater to nark the southern entrance into the harbor of refuge. It is estimated that they can be established for not exceeding $30,000, and it is recommended that an appropriation of this amount be made therefor.

460. Delaware Breakwater (rear), Delaware Bay, Delaware.—The southerly edge of the dark sector of this light was shifted to the southward, so as to cover the entire site of the breakwater of the new national harbor of refuge. Various repairs were made.

462. Mispillion Creek, Delaware Bay, Delaware.—About 12,000 bushels of shells were placed upon the road which leads across the marsh to the light-station. Various repairs were made.

469. Maurice River, Delaware Bay, New Jersey.—Ruby panes were set in the lantern, and the characteristic of the light was changed so that the light is now fixed red, with a narrow fixed white sector covering the entrance to the river from the bay. A survey of the station, including topography, was made, and four granite monuments set to mark the boundaries of the reservation. Various repairs were made.

470, 471. Maurice River range lights, Delaware Bay, New Jersey.—The construction of the dwelling was completed. Lantern posts, temporary oil shed, coal shed, and temporary walks, were erected, and the range lights were exhibited for the first time on October 15, 1898. Various repairs were made. A topographical survey of the station was made, and four granite monuments were set to mark the boundaries of the reservation. Specifications were prepared and a contract made for furnishing the dwelling with window shutters, door and window screens, and the like.

475. Mahon River, Delaware Bay, Delaware.—The shore line continued to retreat during the year, but not sufficiently fast to make it necessary to begin the erection of the new light-house, which work was consequently postponed. The deed to the new reservation was finally approved, and duly recorded. Various repairs were made.

478. Bombay Hook, Delaware River, Delaware.—A topographical survey was made and stone monuments were set to mark the reservation boundaries.

481. Reedy Island (front), Delaware River, Delaware.—Designs and specifications were prepared, contracts made, and the work of rebuilding the boathouse, of erecting the new oil house, and of constructing elevated board walks begun.

483. Salem Creek, Delaware River, New Jersey.—By the act approved March 3, 1899, Congress appropriated $4,000 for rebuilding the tower. A test boring was made and designs and specifications were prepared for a concrete-filled iron tower carrying a fourth-order lantern.

484. Finns Point (front), Delaware River, New Jersey.—A topographical survey was made. Specifications were prepared and a contract made for the construction of a stone sea wall.

487. New Castle range (front), Delaware River, Delaware.—The work of grading and seeding the grounds, grading and graveling the roads, and repairing the sea wall and walks was practically completed. The oil house, pump shed, and a portion of the fences were lowered to correspond to the new grade of the grounds. Drains were laid to carry off water from the dwelling, barn, and garden. Various repairs were made.

489. Deep Water Point range (front), Delaware River, New Jersey.—Some 110 running feet of stone sea wall were constructed. Designs and specifications were prepared and the barn rebuilt. Contract was made for grading and shelling the road, and the work practically completed. Various repairs were made.

490. Deep Water Point range (rear), Delaware River, New Jersey.—Designs and specifications were prepared, a contract made, and the work of erecting a kitchen addition and making repairs to the dwelling begun. A topographical survey of the station was made. Various repairs were made.

492. Christiana, Delaware River, Delaware.—The work of grading and seeding the grounds was practically completed. The road was graded and surfaced with oyster shells, the old barn placed in a serviceable condition, and division and barnyard fences erected. Various repairs were made.

494. Cherry Island range (rear), Delaware River, Delaware.—Designs and specifications were prepared, contract made, and the work of erecting a kitchen addition and making repairs to the light-house begun.

495. Grubbs Landing, Delaware River, Delaware.—Test borings were made upon the proposed site of this beacon. Drawings and specifications for a concrete-filled iron caisson structure were prepared. A temporary pressed-lens lantern light was established on the adjoining wharf and exhibited for the first time on the night of May 25, 1899.

496. Schooner Ledge range (front), Delaware River, Pennsylvania.—The roof of the light-house was repaired and painted. A copper-ribbon lightning conductor, extending to the pinnacle of the lantern, was erected. Various repairs were made.

497. Schooner Ledge range (rear), Delaware River, Pennsylvania.—A topographical survey of the station was made. Various repairs were made.

499. Tinicum Island (rear), Delaware River, New Jersey.—The work of erecting a kitchen addition and making repairs to the dwelling was completed. Various repairs were made.

502, 503, 504. Horseshoe Range, west group, Delaware River, Pennsylvania.—A new brick cistern was built. Various repairs were made.

508, 509. Schuylkill River Range, Schuylkill River, Pennsylvania.—The cellar of the dwelling recently raised was partially filled with sand and gravel in order to bring the floor above standing water. The navy-yard authorities having completed the filling in of the grounds about the station, the barn was moved back to its original position and placed upon a pier foundation. Various repairs were made.

518. Assateague, seacoast of Virginia.—Specifications were prepared and a contract made for repairs to the grounds. Specifications were prepared and a contract made for the erection of about 4,210 feet of board fences. Various repairs were made.

REPAIRS.

At each of the following-named stations repairs of greater or less extent were made during the year:

449. Tucker Beach, N. J.
459. Delaware Breakwater (front), Del.
461. Delaware Breakwater (west end) Beacon, Del.
463. Brandywine Shoal, Del.
464. Fourteen Foot Bank, Del.
465. Murderkill Creek (front) Beacon, Del.
466. Murderkill Creek (rear) Beacon, Del.
472. Egg Island, N. J.
473. Cross Ledge, N. J.
476. Ship John Shoal, Del.
479. Port Penn (front), Del.
480. Port Penn (rear), Del.
482. Reedy Island (rear), Del.
483. Salem Creek, N. J.
484. Finns Point (front), N. J.
488. Newcastle (rear), Del.
491. Christiana Beacon, Del.
493. Cherry Island (front), Del.
494. Cherry Island (rear), Del.
498. Billingsport (front), N. J.
500. Fort Mifflin Bar Cut (rear), N. J.
516. Fenwick Island, Del.
519. Fishing Point Beacon, Va.
520. Killick Shoal, Va.

LIGHT-VESSELS.

453. Northeast end light-vessel No. 44, off the seacoast of New Jersey.—This iron light-vessel was built in 1881–82, is of 304 tons burden old measurement, and has a steam fog-signal. She was last taken from her station on July 15, 1897, when she was docked and painted, and her present automatic steam whistle installed. She was on her station the entire last year. Her boilers are old and worn, and new ones have been contracted for and are being built. She will come off her station about August 15, 1899, to have her new boilers installed and to receive a general overhauling. When returned to her station she will be in a good condition. The stern of her whale boat was changed to a square stern. Provisions, fuel, grate and bricks for galley stove, a suit of sails for launch, paint, etc., were supplied.

454. Five Fathom Bank light-vessel No. 40, off the seacoast of New Jersey.—This wooden light-vessel was built in 1875, is of about 240 tons burden, and has a steam fog-signal. She was on her station during the entire year. She was last taken off on June 5, 1897, when she was hauled out, her bottom was cleaned, and her boilers were repaired and retubed. Her boilers are old and worn, and new ones were contracted for and are being built. She will be taken off her station about July 15, 1899, to have her new boilers installed and to receive a general overhauling. Provisions, fuel, paint, rope, canvas, wire rope for stays, plate glass for lanterns, etc., were supplied.

NOTE.—She was returned to her station on August 21, 1899.

456. Overfalls light-vessel No. 46, entrance to Delaware Bay.—This steel light-vessel was built in 1887, is of about 336 tons burden, and has a steam fog-signal. She was first placed on her station on December 2, 1898, in 73 feet of water, about 3½ miles to the southward and westward of Overfalls or South Shoal, entrance to Delaware Bay. This light-vessel shows two fixed white reflector lights—one from each masthead. The focal plane of the lights is 45 feet above the sea, and the lights are visible 12 miles in clear weather.

Fourth District.

The vessel has two masts, schooner rigged, with a red hoop-iron day mark at each masthead. The hull is straw color, with "OVERFALLS" in large black letters on each side and "No. 46" in black on each quarter. During thick or foggy weather a 12-inch steam whistle sounds blasts of 3 seconds' duration, separated by silent intervals of 27 seconds. New windlass bitts, catheads on bow, new pawls on capstan were supplied, repairs were made to the gallows frame, the fore and main shrouds were taken down and reserved with marline, and the lanyards and rigging were replaced. A new riding bit and cavil and three iron shutters in waist were supplied; the up-and-down fenders on the outside of the hull were replaced; the lamp houses were recovered; a new main boom with goose neck, etc., complete; mooring bitt, windlass bitt, shoe, etc., were supplied, and the boilers were retubed. Rope, hand lanterns, chain hooks, bedding, mooring shackles, tube rods, steam pipe, 120 fathoms 2-inch chain, one 5,000-pound mushroom anchor, etc., were supplied. This vessel was driven from her station by ice and carried to sea on February 11, 1899, when she lost 120 fathoms of 2-inch cable and one mushroom anchor. She was replaced on her station on March 14, 1899. She is in excellent condition.

515. *Fenwick Island Shoal light-vessel No. 52, off seacoast of Maryland.*—This steam iron light-vessel was built in 1892, is of about 416 tons burden, and carries a steam fog-signal. On July 28, 1897, she was taken to a dry dock where her bottom was cleaned and painted and repairs were made to her boiler and fog-signal machinery. She has been on her station the entire year, and will be taken in for repairs about September 15, 1899, when she will be hauled out. Provisions, medicine, fuel, rigging leather, lumber, steam pipe, stock and dies, ratchet and drills, pipe cutter, etc., were supplied.

517. *Winter Quarter Shoal light-vessel No. 45, off the seacoast of Virginia.*—This steel light-vessel was built in 1887, is of about 336 tons burden, and has a steam fog-signal. She has been on her station the entire year. Her general condition is excellent. Paint, fuel, sal soda, bedding, provisions, etc., were supplied.

DAY OR UNLIGHTED BEACONS.

Cape Henlopen day beacon.—A wooden pyramidal skeleton 49 feet high, painted white with a black cross, located two-thirds of a mile from Cape Henlopen light-house. A new day mark was erected in the rear of the old day mark, which had been undermined by the encroaching sea.

FOG-SIGNALS OPERATED BY STEAM, HOT AIR, OR OIL ENGINES.

453. *Northeast End light-vessel No. 44, New Jersey.*—The 12-inch steam whistle was in operation about 454 hours and consumed some 21 tons of coal.

454. *Five Fathom Bank light-vessel No. 40, New Jersey.*—The 12-inch steam whistle was in operation some 490 hours and consumed about 27 tons of coal.

456. *Overfalls light-vessel No. 46, entrance to Delaware Bay.*—The 12-inch steam whistle, established December 2, 1898, was in operation some 299 hours and consumed about 11 tons of coal.

458. *Delaware Breakwater (east end), Delaware.*—The second-class Daboll trumpet was in operation some 607 hours and consumed about

242 gallons of mineral oil. On June 25, 1899, the characteristic of this fog-signal was changed so as to sound blasts of two seconds' duration, with silent intervals of thirteen seconds. This change was made on account of the similarity to the fog-signal of the Overfalls light-vessel No. 46.

464. *Fourteen-Foot Bank, Delaware Bay, Delaware.*—The second-class Daboll trumpet, operated by a hot-air engine, was in operation some 429 hours, and consumed about 2 tons of coal.

515. *Fenwick Island Shoal light-vessel No. 52, Maryland.*—The 12-inch steam whistle was in operation 348½ hours, and consumed about 36 tons of coal.

517. *Winter Quarter Shoal light-vessel No. 45, Virginia.*—The 8-inch chime whistle, run by a 3½-horsepower oil engine, was in operation 544 hours, and consumed about 485 gallons of mineral oil.

BUOYAGE.

There were maintained last year on the seacoast from Squan Inlet, New Jersey, to Chincoteague Inlet, Virginia, 26 buoys; in Barnegat Inlet, New Jersey, 8 buoys; in Little Egg Harbor Inlet, New Jersey, 7 buoys; in Absecon Inlet, New Jersey, 5 buoys; in Great Egg Harbor Inlet and River, New Jersey, 13 buoys; in Townsend Inlet, New Jersey, 3 buoys; in Hereford Inlet, New Jersey, 5 buoys; in Delaware Bay and River and Schuylkill River, 114 buoys; in Chincoteague Inlet, Virginia, 5 buoys; in Metomkin Inlet, Virginia, 3 buoys. In all, 189 buoys.

GAS-LIGHTED BUOYS.

474. *Elbow of Ledge gas buoy, No. 14.*—A gas-lighted buoy was in position until January 13, 1899, when it was removed in a damaged condition. A first-class iron spar buoy was placed to mark the station during absence of the gas buoy. On January 23, 1899, the gas buoy was replaced on its station. It dragged from its station on February 3, 1899, and was replaced on February 4. On February 9, 1899, it disappeared from its position and was replaced on March 5. The light failed on March 5, 1899, and the buoy was relighted by the keeper of Cross Ledge light-house.

486. *Goose Island Flat gas buoy, No. 26.*—A gas buoy was in operation from July 1, 1898, until January 3, 1899, when it was dragged from its station. It was recovered, and an ice buoy was, on the same date, placed to mark the station. The gas buoy was replaced and maintained until the end of the year. On April 10, 1899, the gas buoy was reported as not burning, and was relighted on April 12. It was again relighted on May 1, 1899.

Some 5,373 cubic feet of gas was supplied to gas buoys during the year.

DEPOTS.

Edgemoor light-house depot, Delaware River, Delaware.—Some minor repairs were made, but no work of special importance was done.

The following recommendation, made in the Board's last two annual reports, is renewed:

> The keepers of this depot are now obliged to live in Wilmington, about 4 miles distant. It is estimated that a suitable dwelling and necessary outbuildings can be built for not exceeding $5,000. Recommendation is therefore made that an appropriation of this amount be made therefor.

Fourth District.

Chincoteague, Chincoteague Inlet, Virginia.—The spare buoys for Chincoteague and Metomkin Inlets are stored here. It is also used as a depot for Assateague and Killick Shoal light-houses, and when the boat from Winter Quarter Shoal light-vessel comes in it is laid up at this depot while the men are ashore.

TENDERS.

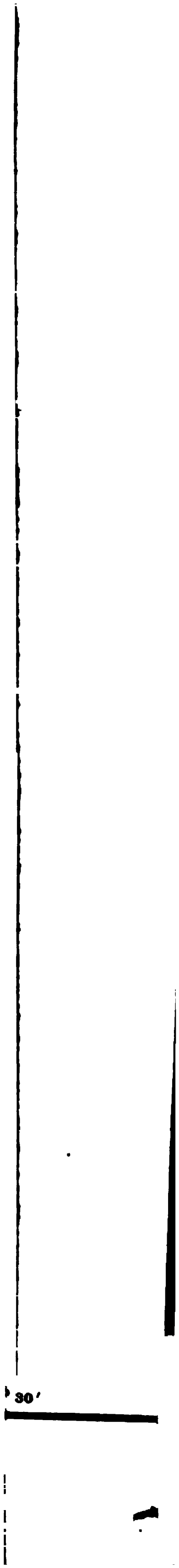
Zizania.—This steel twin-screw steamer was built in 1887, and is of 331 net tons burden. She was employed throughout the year, except thirty-four days when she was laid up for repairs, in attending to buoyage, in towing light-vessels to and from their stations, in delivering fuel and supplies to light-vessels and stations, and the like. She replaced and renewed 24 buoys, changed 124, restored 8, shifted 1, lifted and painted 15, removed 7, placed 5, and recovered 5 buoys. She delivered some 196 tons of coal and about 10 cords of wood to light-vessels, and about 133 tons of coal and 10 cords of wood to light-houses. She also delivered the annual allowance of provisions to five light-vessels and ten light-houses, and conveyed the light-house inspector to light vessels and stations for their inspection, and delivered supplies to vessels and stations. Two trips were made to the Portsmouth, Va., buoy depot during the year—one in September, when she left Philadelphia at 6.30 a. m. on the 20th, and arrived at the Edgemoor depot with light-vessel No. 46 at 5.30 p. m. on the 23d; the other in June, when she left this district at 6 a. m. on the 26th, and was lying at Portsmouth, June 30, 1899, waiting for relief light-vessel No. 16. One trip was made to the general light-house depot, Tompkinsville, N. Y., for towing light-vessel No. 47, on December 5, arriving on December 6, 1898. On that day she left Staten Island for the Fourth district and resumed her regular duties on the next day. In doing this work she steamed about 10,951 miles and consumed some 820 tons of coal and some 6 cords of wood. Eight and one-half days' work was done at Edgemoor depot and the iron pier at Lewes, Del. Various repairs were made to the tender. Lubricating oil, soap, waste, grate bars, crockery, rope, paint, brooms, etc., were supplied.

Launch Leal.—This naphtha launch assisted in general repair work during the year, except between January 1, 1899, and April 18, 1899, when she was stored at the Edgemoor depot.

Tender for engineer Fourth district.—The following recommendation made in the Board's last annual report is renewed:

> There is no vessel permanently available for the engineer service of construction and repair in this important district. Temporary arrangements were made by transferring the tug *Thistle* from the Fifth district, but as this latter district has a large number of lights on inland waters, and a boat like the *Thistle* is essential for their proper maintenance, she was returned to the Fifth light-house district on January 3, 1898, where she is now in use. A suitable vessel for the permanent service of construction and repair is much needed in the Fourth district, which now has only one permanent tender attached.

5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FIFTH DISTRICT.

istrict extends from, but does not include, Metomkin Inlet, , to and including New River Inlet, North Carolina. It s all aids to navigation on the seacoast of Virginia and North between the limits named, all of Chesapeake Bay, and the of North Carolina and tributary waters.

tor.—Commander Charles T. Hutchins, United States Navy, ust 25, 1898; Commander C. M. Thomas, United States Navy, 17, 1899; since then, Commander E. P. Wood, United States

eer.—Lieut. Col. William A. Jones, Corps of Engineers, United Army.

is district are—

ouses and beacon lights, including 6 post lights	139
essels in position	3
nlighted beacons	10
nals operated by steam, caloric, or oil engines	4
nal operated by petroleum engine	1
nals operated by clockwork	67
ng buoy in position	1
oys in position	2
hted buoys in position	3
buoys in position, including pile buoys and stakes	1, 131
rs *Holly*, *Maple*, and *Violet*, buoy tenders, and for supply and inspection.	3
launch *Bramble*, used to supply gas to the beacons in the sounds of h Carolina	1
e (and gas tank) for supplying beacons and coast stations	2
ers *Jessamine* and *Thistle*, for construction and repairs	2

LIGHT-STATIONS.

1. *Hog Island, Great Machipongo Inlet, seacoast of Virginia.*—Some running feet of new picket fence 5 feet high was built, inclosing ight-house tract, with two double and three single gates. About 0 feet of ditches were cut and two wooden troughs were made to n the premises, and the lot was thoroughly graded. Some 257 ning feet of wooden walks were laid from the entrance gate to the n road. The old sheds, shops, and storehouses, the old tramway, the derrick, boiler and engine used in the construction of the sta- n, were removed. A platform, with steps connecting one of the out- ldings with the dwelling, was made. The fences and all the buildings ept the tower and dwellings were thoroughly painted.

523. *Cape Charles, on Smith Island, entrance to Chesapeake Bay, sea- st of Virginia.*—The iron tower was painted two coats. The tele- ones for intercommunication of keepers were put in order.

524. *Cape Henry, entrance to Chesapeake Bay, Virginia.*—A test was ade in December of the audibility of the fog-signal.

525. *Thimble Shoal, north side of the channel to Hampton Roads, Vir- inia.*—New model fourth-order lamps were installed. The illumina- ing apparatus was thoroughly overhauled and repaired.

528. *Craney Island, mouth of Elizabeth River, Virginia.*—On August 20, 1898, a new lens, flashing white every five seconds, was substituted for the fixed white apparatus hitherto in use. Various repairs were made.

Fifth District.

529. Western Branch beacon, Elizabeth River, Virginia.—A pine pile, 60 feet long, was driven, over the upper part of which was placed a cast-iron sleeve and column for supporting the light, and an iron ladder for reaching it. A triangular frame for protecting this central pile column was made by driving three oak piles, one at each angle, 40 feet long and 18 inches in diameter, sheathed for a length of 17 feet with yellow metal, and surmounted by 12-inch cap logs 16 feet long bolted to them, and 15 pine fender piles 53 feet long, also metal sheathed, placed in sets of three at each corner, with two intermediate piles on each side, were bolted to the cap logs. The structure is painted black and stands in 14 feet of water. A temporary fixed red-lantern light, 16 feet above mean high water was shown from it for the first time on May 26, 1899. This will be replaced on July 1, by a standard lens lantern.

532. Nansemond River, entrance to Nansemond River, Virginia—New model fifth-order lamps were supplied.

533. White Shoal, James River, Virginia.—One of the foundation piles was strengthened by an iron band placed around it. New model fifth-order lamps were supplied in June. Various repairs were made.

534. Point of Shoals, James River, Virginia.—In June new model fifth-order lamps were installed. Various repairs were made.

536. Jordan Point, James River, Virginia.—The piers under the tower were pointed, one pier was rebuilt, and one was underpinned. A plank walk was laid between the dwelling and the storehouse, and the brick pavement in front of the dwelling was repaired. Various repairs were made.

537, 538. Dutch Gap Cutoff, James River, Virginia.—An iron oil house was erected, some repairs were made, and some 335 running feet of plank walks were laid.

539. Back River, entrance to Back River, Virginia.—The cistern house was practically rebuilt, and the rear porch and the elevated walk leading to the tower were repaired.

540. York Spit, entrance to York River, Virginia.—New model fourth-order lamps were installed. Various repairs were made.

541. Old Plantation Flats, east side of Chesapeake Bay, Virginia.—A test was made of the audibility of the fog-signal. Various repairs were made.

547. Tue Marshes, entrance to York River, Virginia.—New model fifth-order lamps were supplied in November. Various repairs were made.

549. Pages Rock, York River, Virginia.—New model fourth-order lamps were installed in October. Minor repairs were made.

550. Purtan Bay post light, No. 1, York River, Virginia.—On December 2, 1898, this structure was damaged by the wind and waves so that it was not practicable to exhibit the light until new piles were driven. This was done in January, 1899, and the light was ready for exhibition, but the new structure was carried away again by ice February 13. New piles were again driven and the light reestablished on the night of March 22, 1899.

551. Purtan Island post light, No. 4, York River, Virginia.—The pile structure from which this light was exhibited was carried away by ice on February 14, 1899. New piles were driven and the light reestablished on March 22, 1899.

552. Potopotank Creek post light, York River, Virginia.—The pile structure from which this light was exhibited was carried away by ice on February 13, 1899. New piles were driven and the light reestablished on March 22, 1899.

553. Bells Rock, York River, Virginia.—New model fourth-order lamps were installed.

555. Wolf Trap, on shoal between York and Rappahannock rivers, Virginia.—New model fourth-order lamps were installed. A new reed was supplied for the Daboll trumpet, the engine and air pump were overhauled, and a test was made of the audibility of the fog-signal. Various repairs were made.

556. Stingray Point, mouth of Rappahannock River, Virginia.—New model fifth-order lamps were supplied in January. On April 12, 1899, the order of the light was changed by the substitution of a fifth-order lens for the sixth-order one previously in service.

——. *Beacon lights on Rappahannock River, Virginia.*—The following statement, in effect, was made in the Board's last six annual reports and is renewed:

> The trade on this river is growing rapidly. At certain seasons of the year ten or more large steamers make weekly trips here, carrying vegetables, fruits, and the like. As the river is inadequately lighted, these steamers with their perishable freight often have to tie up at night for the lack of guiding lights. The Board recommends the establishment of a red light at the entrance to Carters Creek, at a cost not exceeding $3,000, and of three beacon lights, one on or near Sharp's wharf, below Suggett Point, one on Tappahannock wharf, and one on Taylor's wharf, at an estimated cost of $100 each. Recommendation is made that $3,300 be appropriated for this purpose.

558. Windmill Point, mouth of Rappahannock River, Virginia.—The lantern cowl was repaired. New model fifth-order lamps were installed and the fog-bell machinery was adjusted.

559. Watts Island, east side of Tangier Sound, Virginia.—New model fifth-order lamps were supplied in May and a zinc hood for protecting the lens from rain drip was furnished.

561. Janes Island, entrance to Little Annemessex River, Maryland.—New model fourth-order lamps were installed.

562. Somers Cove, north side of Little Annemessex River, Maryland.—New model fifth-order lamps were supplied.

563. Great Wicomico River, entrance to Great Wicomico River, Maryland.—New model fourth-order lamps were installed. Repairs were made to the fog-bell machine.

564. Smith Point, mouth of Potomac River, Virginia.—New model fourth-order lamps were supplied.

565. Point Lookout, entrance to Potomac River, Maryland.—New model fourth-order lamps were supplied.

—. *Ragged Point, Potomac River, Virginia.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> This shoal makes off from the west bank of the river at a short turning point. It is important that this point be marked by a light at night and a fog signal during thick weather. It is estimated that a light and fog-signal station can be established here for $20,000, and it is recommended that an appropriation of this amount be made therefor.

572. Cobb Point Bar, entrance to Wicomico River, Maryland.—New model fourth-order lamps were supplied.

574. Lower Cedar Point, Potomac River, Maryland.—New model fourth-order lamps were installed.

580. Holland Island Bar, entrance to Holland and Kedge Straits, Maryland.—New model fourth-order lamps were supplied. A zinc lens protector was provided.

Fifth District.

581. *Solomons Lump, Kedge Straits, Maryland.*—New model fifth-order lamps were installed and new falls for the landing ladder were supplied.

—. *Point No Point, west side of Chesapeake Bay, between Potomac and Patuxent rivers, Maryland.*—The Board's annual report for 1894 contained the following recommendation:

> There is a stretch of about 30 miles between the Cove Point and Smith Point lights which should be better lighted. For part of the distance navigators are without a guide where a deviation from their sailing course might carry vessels of heavy draft onto dangerous shoals. There are many of this class of craft now trading to Baltimore, and their number is increasing. A light house on the shoal off Point No Point is therefore urgently needed.

Petitions for light at this locality have lately become quite urgent. It is estimated that a light-house and fog-signal on a caisson structure in from 20 to 21 feet of water can now be erected for about $65,000. It is therefore recommended that an appropriation of this amount be made therefor.

582. *Great Shoals, mouth of Wicomico River, Maryland.*—The fog-bell machine was repaired, new model fifth-order lamps were installed, and the tin roof was repaired.

583. *Sharkfin Shoal, between Clay and Bloodworth islands, Maryland.*—New model fourth-order lamps were installed and material was supplied for renewing the roof, gutters, and downspouts.

584. *Hooper Strait, entrance to Tangier Sound, Maryland.*—New model fifth-order lamps were supplied.

585. *Hooper Island, east side of Chesapeake Bay, between Tar Bay and Hooper Strait, Maryland.*—A boring was made at the proposed site to ascertain the depth at which a safe foundation might be obtained for the new structure. Designs for the latter were adopted. Detailed plans and specifications were prepared. Contracts were made for the metal work for $18,955 and for the erection of the light-house at the site for $29,000. The construction of the metal work is progressing satisfactorily. By the terms of the contract the caisson, the foundation cylinder, and the ironwork required for the completion of the brickwork of the foundation pier are to be delivered by September 13 and the rest of the work within three months thereafter.

586. *Cedar Point, mouth of Patuxent River, Chesapeake Bay, Maryland.*—New model fourth-order lamps were supplied. The fog-bell machine was repaired. Repairs were made.

587. *Drum Point, entrance to Patuxent River, Maryland.*—New model fourth-order lamps were installed.

588. *Cove Point, entrance to Patuxent River, Maryland.*—New model fourth-order lamps were supplied.

589. *Sharps Island, entrance to Choptank River, Maryland.*—A new smoke pipe was put up. New model fourth-order lamps were installed.

591. *Bloody Point Bar, entrance to Eastern Bay, Maryland.*—The fog-bell machine was replaced by one of improved pattern with a different striking arrangement and the necessary change was made in the position of the bell. The copper smoke pipe was renewed, the inflow pipes of water tank were repaired, and the doors and windows throughout the house put in order.

592. *Thomas Point Shoal, off Thomas Point, Chesapeake Bay, Maryland.*—New model fourth-order lamps were supplied.

593. *Greenbury Point Shoal, entrance to Severn River, Maryland.*—New model fourth-order lamps were supplied.

Fifth District.

595. Love Point, on shoal making out from Kent Island, Maryland.—New model fifth-order lamps were installed.

599, 600, 601. Rockhall Creek beacon lights, Maryland.—Three beacon structures were erected to mark the dredged channels into Rock Hall Creek, easterly side of Chesapeake Bay, Maryland. They consist, each, of three equidistant wooden piles, braced together, with an independent pile in the center on which the lantern, showing a fixed white light, is placed. Beacons Nos. 1 and 3 are painted red and No. 2 white. They were first lighted on November 1, 1898. One of the beacons was carried away by the ice in February and another pushed over. They were reestablished in April.

602. Baltimore light and fog-signal station, Patapsco River, Maryland.—The experimental disk pile was completed and delivered at the Lazaretto light-house depot early in September, and on September 9, 1898, an unsuccessful effort was made to plant it at the site. After two hours continuous pumping with two pumps having 4-inch suction, and 3-inch and 2-inch discharge, respectively, the pile could be made to sink only 3 feet 6 inches into the mud strata. Further attempt was accordingly abandoned, and the pile was brought back to the depot.

It is now evident that the expense of building a light-station in the 55 feet of semifluid mud which overlays the sandy bottom will be great. It is estimated that it will cost $60,000, in addition to the $60,000 already appropriated, to build this light-station at the site selected. The Board therefore recommends that $60,000 be appropriated in addition to the $60,000 appropriated by the act of August 18, 1894.

603. Craighill Channel (front), Chesapeake Bay, Maryland.—New model fifth-order lamps were installed. Various repairs were made.

604. Craighill Channel (rear), Chesapeake Bay, Maryland.—New model fourth-order lamps were installed. Minor repairs were made.

605. Seven-foot Knoll, mouth of Patapsco River, Maryland.—New model fourth-order lamps were installed. The old water tank was replaced by two new and smaller ones. Three iron clamps were made for the fuel platform, and the trap door of the main gallery deck was repaired.

608. Fort Carroll, Patapsco River, Maryland.—On account of its interference with necessary improvements in progress at this fort under the direction of the United States Engineer Department, the old light and fog-bell tower was torn down on October 17, 1898, the lens and fog-signal apparatus having been previously removed. A lens-lantern placed on the parapet of the fort in front of the former position of the light was shown in its stead until December 30, 1898, when the former light was reestablished on a new wooden tower erected about 100 feet northerly from the site of the old structure. The fog bell, which had meanwhile been rung by hand from a position on the parapet, was placed on the new tower on the same date and reoperated by machinery. The focal plane of the light is 45 feet above mean high water instead of 74 feet, as heretofore. New model fifth-order lamps were installed.

612. Pooles Island, off the mouth of Gunpowder River, Maryland.—New model fourth-order lamps were supplied. The fall of the fog-bell hammer was increased 2½ inches to augment the volume of sound projected.

613. Turkey Point, head of Chesapeake Bay, Maryland.—New model fourth-order lamps were supplied. The adjustment of the fog-bell hammer was improved and a new spring was furnished for the striking apparatus.

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614. Fishing Battery, below entrance to Susquehanna River, Maryland—New model fifth-order lamps were supplied.

615. Havre de Grace, mouth of Susquehanna River, Maryland.—New model fifth-order lamps were supplied.

617. Old Field Point post light, Elk River, Maryland.—Another light being necessary in this river, one will be erected on the point of the shoal off Old Field Point early in the next fiscal year.

622. Cape Hatteras beacon, about one-quarter mile from the extremity of Cape Hatteras Point, North Carolina.—The light post was moved 145 yards nearer to the tower, beyond the reach of the high tides.

624. Ocracoke, entrance to Ocracoke Inlet, North Carolina.—New model fourth-order lamps were supplied. Various repairs were made.

639. North River, entrance to North River, North Carolina.—New model fifth-order lamps were installed. Various repairs were made.

640. Wade Point, Albemarle Sound, North Carolina.—At the date of the last annual report the construction of the metal work required in the rebuilding of this light-house was in progress under contract, and the printing of the plans and specifications for the erection of the structure had been commenced. On August 26, 1898, the metal work was all delivered at the Lazaretto light-house depot. A contract was made for the erection of the light-house at the site with the lowest bidder. The contractor with his materials and working plant arrived at the site November 25, 1898, and the construction of the temporary platform from which the erection of the light-house was to be carried on was begun the next day. The pile foundation, or substructure, was in place January 7. The framework of the superstructure was raised January 14. The exterior, including tinwork, was completed on February 18; the fuel platform and most of the inside work, February 28, and the entire structure, including painting, on March 14—a week earlier than the time stipulated in the contract. The work was creditably done in every respect. After its completion the old light-house, except the pile foundation, was dismantled and removed. The lens, being out of repair, was not transferred to the new structure, but was retained for use elsewhere after being put in order. The fog bell and striking apparatus, the boat hoisters, the supplies and keeper's outfit, their furniture, etc., were removed to the new house, the new lens apparatus provided for it was placed in position, and the new light was shown for the first time April 17, 1899. The structure is composed of a two-story square wooden dwelling, with a gable roof, resting on a substructure consisting of five wooden piles provided with cast-iron sleeve columns fitting over them, and braced and tied together by means of beams, struts, and tie rods, and supporting an iron lantern, with a copper roof, from which is shown the light, 39 feet above mean high-water level.

642. Laurel Point, Albemarle Sound, North Carolina.—New model fourth-order lamps were supplied, the fog-signal apparatus was overhauled, the interval of striking adjusted, and the force of the blow increased. Various repairs were made.

646. Alligator River beacon, mouth of Alligator River, Albemarle Sound, North Carolina.—On December 1, 1898, a fixed white light was established on Great Shoal, at the entrance to this river. Several times it was extinguished during the winter by birds flying against the lantern, but measures will be taken to protect the light before another winter. A platform was built by the keeper so that the lantern could be cleaned without taking it down.

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647. *Croatan, between Croatan and Albemarle sounds, North Carolina.*—New model fourth-order lamps were installed and a new landing ladder was put up to replace one carried away by the ice.

648. *Blockade Shoal beacon, Croatan Sound, North Carolina*—A beacon structure was erected in October on the westerly side of the channel in Croatan Sound, off Pork Point, in about 12 feet of water, to mark the shoal known as The Blockade. The light is fixed white, shown from a lantern about 16 feet above mean high water, placed on a black iron column, surrounded by a triangular protection of wooden piles. It was first exhibited December 1, 1898. A few months afterwards the structure was run into by an unknown vessel, somewhat injuring the pile protection.

649. *Roanoke Marshes, between Pamlico and Croatan sounds, North Carolina.*—New model fourth-order lamps were installed. The fog bell, which was badly cracked, was replaced.

650. *Long Shoal, Pamlico Sound, North Carolina.*—New model fourth-order lamps were installed.

651. *Hatteras Inlet, Pamlico Sound, North Carolina.*—The fog-bell machine was replaced and a new floor was laid under the bell weights. New model fourth-order lamps were installed. Minor repairs were made.

652. *Gull Shoal, Pamlico Sound, North Carolina.*—New model fourth-order lamps were installed.

653. *Southwest Point Royal Shoal, Pamlico Sound, North Carolina.*—New model fifth-order lamps were supplied.

654. *Northwest Point Royal Shoal, Pamlico Sound, North Carolina.*—Some 16 iron bands were placed around the foundation piles and 24 new tension braces were secured in place. New model fourth-order lamps were supplied. Various repairs were made. The site of this light-house, on the edge of a shoal that is wearing away, is unsafe. The house is so low that during the hurricane of August 17, 18, and 19, 1899, the storm seas dashed over it, doing much damage. The recent efforts made to strengthen this structure were unsuccessful. It oscillates so badly in ordinary weather that it is impracticable to keep the roof from leaking. It is important that a new structure be erected soon at a point farther back on the shoal. This is one of the most important light-house sites in the sounds of North Carolina. It is estimated that the proposed work can be done for not exceeding $30,000, and the Board therefore recommends that an appropriation of this amount be made therefor.

655. *Harbor Island Bar, Pamlico Sound, North Carolina.*—New model fifth-order lamps were supplied. Various repairs were made.

656. *Brant Island Shoal, Pamlico Sound, North Carolina.*—New model fifth-order lamps were installed. Minor repairs were made.

657. *Pamlico Point, Pamlico Sound, North Carolina.*—New model fourth-order lamps were installed and some minor repairs were made. The weight chain of the fog-bell apparatus was repaired and the bell weights, lost overboard, were recovered and put in place.

659. *Rodman Point Shoal, Pamlico Sound, North Carolina.*—This beacon was demolished by a towboat running into it on January 17, 1899. It was rebuilt, and the light was reestablished.

661. *Neuse River, entrance to Neuse River, North Carolina.*—New model fifth-order lamps were installed and minor repairs were made.

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NEW LAMPS.

With a few exceptions all of the fourth, fifth, and sixth order lamps were replaced with the new model fourth and fifth order lamps. All the lamps are now either first, fourth, or fifth orders. Photometric tests show that with the fourth-order lamps there has been a gain in light from the lamps alone, while, owing to the improved size and shape of the flame, the light projected from the lenses will be improved in a much greater proportion. Furthermore, serious defects which resulted in melting and whitening the chimneys and a flickering light have been overcome. The consumption of chimneys is now insignificant. For the fifth and sixth orders a lamp of 36 candlepower is used, while in the light projected from the lens great improvement is expected from the better shape of the flame, which gets a good light on the lower rings of the lenses. These new lamps throw a strong light upon the horizon and will be more visible in thick weather.

REPAIRS.

Repairs of minor importance were made at the following-named stations:

526. Old Point Comfort, Va.
531. Newport News Middle Ground, Va.
535. Deep Water Shoals, Va.
542. Cherrystone, Va.
554. New Point Comfort, Va.
560. Tangier Sound, Va.
571. Blackistone Island, Md.
575. Mathias Point Shoal, Md.
578. Fort Washington, Md.
579. Jones Point, Va.
594. Sandy Point, Md.
609. Hawkins Point, Md.
611. Lazaretto Point, Md.
619. Currituck Beach, N. C.
621. Cape Hatteras, N. C.
625. Cape Lookout, N. C.
645. Roanoke River, N. C.

LIGHT-VESSELS.

522. *Cape Charles light-vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This composite vessel was built in 1890–91, is of about 298 tons burden, and has a steam fog-signal. On March 7, 1899, in a heavy southwest snowstorm, the moorings parted at 9.30 a. m. and the vessel went adrift, losing her anchor and 82 fathoms of 2-inch stud chain. Sail was immediately made and the vessel was hove to on the starboard tack, and at 2 p. m. she was in 11 fathoms of water and drifting ESE. about 2 knots, and at midnight was in 14 fathoms, Cape Henry light bearing W. by N., distant 28 miles. On the morning of March 8, the weather moderating, sail was made. The wind was WSW., and the vessel was brought up for the Capes, but her bottom was so foul she would not sail and drifted off to leeward. At midnight Currituck Beach light was sighted. At 1.30 p. m. March 9, when Cape Henry light bore NW. distant 12 miles, the steamship *Deremore*, bound from Cuba for Philadelphia, took her in tow, and at 5.45 p. m. the light-vessel was anchored in Hampton Roads. The tender *Maple* next day towed her to the Portsmouth, Va., light-house depot, where she was supplied with new chain and a Martin anchor borrowed from the Norfolk Navy-Yard until a suitable mushroom anchor could be obtained from the general light-house depot. After receiving fuel and small stores she was towed by the tender *Maple*, on March 17, to her station. On February 11 one cylinder of the feed pump burst, and the injector had to be used for feeding the boiler. Her bottom was foul, and the vessel required overhauling and repair. As no relief vessel was available in the dis-

trict, light-vessel No. 16, belonging in the Third light-house district, was towed to the Portsmouth, Va., light-house depot by the supply steamer *Armeria.* On April 14 light-vessel No. 16 was towed by the tender *Maple* to this station and light-vessel No. 49 towed to Baltimore. Contract for her repair according to specifications was made. The vessel was hauled out, the copper sheathing was removed, the rudder was lifted and overhauled, and the bottom and sides of the vessel were thoroughly cleaned. All strainers were replaced by new ones of yellow metal, and the rudder drum was calked and fitted with a lead covering extending the entire length of the drum. The oakum was removed from the sheathing and planking and the seams were well payed with pitch below the water line and with putty above. After the calking was completed the wood sheathing was replaced, a covering of hair felt was placed over the sheathing, and then she was remetaled with copper. About 200 bolts, securing the 4-inch planking to the frames and plates, were removed and larger bolts were fitted. The main and forecastle decks were recalked, defective plugs were replaced, and all split planks were repaired. The air ports and scuppers were repaired and the former were fitted with new rubber packing. The canvas on the top of the deck house was removed, much woodwork was renewed, and new canvas was laid and painted. The starboard hawse pipe was taken out and a new one fitted, all decayed wood was replaced, and the bow was made water-tight. The steam windlass was overhauled and put in good condition, a spring pawl was fitted in the chain stopper, a window was furnished for the lantern house, the belfry overhauled, the galley smokestack was repaired, the galley stove was overhauled, the after winch was put in good condition, and all water tanks were cleaned and cement washed inside and painted outside. A new mainmast was placed in position, the head of the foremast was repaired, and all the standing rigging was lifted and renewed and reset. The cast-iron floor in the fire room was replaced. The covering was removed from the boilers and they were cleaned and scraped, new rivets driven where necessary, the seams were calked, new dry pipes were fitted, and new safety plugs were furnished; the bridge walls were repaired and fitted with new soapstone, the tubes were calked and made steam tight, and the furnace doors were repaired. New safety valves were furnished to each boiler and new brass pipes for the gauges. New check valves and stop valves were fitted to the boilers and both sea valves were overhauled. A new feed pump was fitted and all the piping throughout the vessel was repaired where necessary. The injector and whistle engine were disconnected and overhauled and new fittings were furnished where necessary. New covering was fitted to the boilers and pipes. The vessel inside and outside was painted two coats, and necessary articles of outfit were supplied. New running rigging was furnished. The vessel was coaled and towed by the *Maple* to her station on July 1, 1899. During the year 2,570 steamers, 19 ships, 26 barks, 9 brigs, and 2,123 schooners passed by or in the vicinity of this station.

527. Bush Bluff light-vessel, entrance to Norfolk, Elizabeth River, Virginia.—The schooner *Drift*, which is borrowed from the Coast and Geodetic Survey, remained on the station during the year. On February 13, 1899, she was dragged about 100 yards by running ice, and on the 18th was replaced by the tender *Holly.* On June 19, 1899, the crew of the tender *Violet* broke out, cleaned, and whitewashed the bilges, and assisted in putting the vessel in good order. On the night of May 23 the schooner *H. M. Sumner*, of Philadelphia, fouled this vessel, but did no damage except to her own sails and rigging. The crew of the light-vessel assisted the schooner in getting clear.

—. *Cape Lookout Shoals light-vessel, North Carolina.*—The following recommendation in effect was made in seven preceding annual reports of the Board and is renewed:

> Cape Lookout Shoals extend 8 miles beyond the point of the cape. There are dangerous breakers on the shoals 5 miles from the cape. When a vessel drawing more than 15 feet of water has made sufficient offing to just clear these shoals, she is 10 miles distant from the Cape Lookout light. Although this light is of the first order, shown from a tower 150 feet high, and should be seen a distance of 18 miles under favorable circumstances, it may happen during thick or hazy weather that a mariner may fail to see it in time to avoid that line of shoals. A light-ship of the improved model now constructed for use at exposed stations, and provided with a steam fog-signal, to cost $90,000, approximately, would be a valuable aid to navigation if placed near the southern extremity of the shoals. It is therefore recommended that an appropriation of that amount be made therefor.

623. *Diamond Shoal light-vessel, No. 71, off the outer shoals off Cape Hatteras, North Carolina.*—This self-propelling composite steam light-vessel was built in 1897–98, is of about 450 tons burden, carries a steam fog-signal, and shows an electric light. At the beginning of the fiscal year this light-vessel marked Diamond Shoal, North Carolina, and she continued in position until November 24, 1898, when light-vessel No. 69 took her place, and she was taken to Baltimore under her own steam for repairs. Contract was made for general repair and for putting diagonal straps into this vessel, all of which work will be completed this fall.

623. *Diamond Shoal light-vessel, No. 69.*—This composite steam light-vessel was built in 1897–98, is of about 450 tons burden, carries a steam fog-signal, and shows electric lights. At the beginning of the fiscal year she was used as a tender and was manned by the officers and crew taken from the tender *Maple* when that tender was turned over to the Navy for service during the war with Spain. This light-vessel proved to be quite useful in supplying light-stations, but on account of her deep draft and her lack of speed she was unable to do all the work of that tender. On September 18, 1898, the war being over and the *Maple* having been returned to the Light-House Service, the officers and crew were transferred back to the *Maple*, and light-vessel No. 69 was towed to Baltimore, where she was overhauled and repaired. On November 24, 1898, the light-vessel having received necessary supplies, the crew of the *Maple* took her under her own steam to her station, when she relieved light-vessel No. 71 off Diamond Shoals, North Carolina, and remained in position until January 6, 1899, when, in a heavy south-southwest gale, she began to drag her anchor, but steam was soon raised and the engine started ahead, when the sternway was checked. Her engine was kept running until the gale moderated and the wind hauled to the northwest, and when Cape Hatteras light became visible no perceptible change could be seen in the bearing of that light, though the water had deepened to 36 fathoms. On the morning of January 8, the sea having gone down, the anchor was hove up, when it was found that the stock was broken off close to the umbrella part, and it was therefore necessary for the vessel to put into the Portsmouth, Va., light-house depot for a new mooring. There being no mushroom anchor on hand, she was furnished with a 500-pound mushroom sinker, and after filling her tanks with water and taking on some small stores she returned to her station on Diamond Shoal on January 12, but it being too thick to get a bearing on Cape Hatteras light, she reached the right position as near as possible and anchored, showing riding lights only. When

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it was clear enough to see Cape Hatteras light she took her proper place, but until that time the riding lights alone were shown. On the night of January 25 she was dragged about 1¼ miles out of place. As soon as practicable she returned to her station. Again, on the night of February 1, she dragged a mile to the southward and returned to her station the next day. On February 14 she dragged into 36 fathoms of water without changing the bearing of Cape Hatteras light. She returned to her station the next day. On April 4 she dragged to the northeast until the water deepened to 37 fathoms, but returned to her station on April 10. On each of these occasions she got back to her station with her own steam. During the year the vessel was supplied regularly with rations and coal by the tender *Maple*. The work of transferring from 35 to 40 tons of coal from the *Maple* to the light-vessel at this exposed place in the open ocean was arduous and difficult, especially in the winter season. The usual small stores were furnished from time to time to keep the vessel in efficient condition. During the year 2,570 steam vessels and 2,576 sailing vessels passed by or in her immediate vicinity.

NOTE.—In the cyclone of August 16 and 18, 1899, light-vessel No. 69 was driven from her anchorage off Diamond Shoal, N. C., in spite of her efforts to steam against it. The vessel was thrown on shore near Creeds Hill, N. C., life-saving station.

An agreement was made with the Chapman-Merritt Wrecking Company for $15,000 to haul her off and deliver her at port, where she can be repaired.

The conduct of the officers and crew of this ship, during the storm and after the vessel had been thrown on shore, was such that the Board felt impelled to commend them in its letter of September 16, 1899, which was addressed to them through the inspector of the Fifth lighthouse district. The master's account of the disaster is subjoined herewith:

DIAMOND SHOAL LIGHT-VESSEL,
Creed Hills Life-Saving Station, N. C., August 21, 1899.

Commander E. P. WOOD, United States Navy,
Inspector Fifth Light-House District, Baltimore, Md.

SIR: I regret to have to report that this vessel struck the beach, under my charge, on August 18, at 3.30 a. m., in one of the severest hurricanes I ever experienced, commencing on Tuesday, the 15th, at 4 p. m., and not letting up until Saturday. Fourteen hours after we were taken off the wreck by the life savers. Barometer, 29.70.

Wednesday, August 16.—Came in with a hurricane from east. 7 a. m., ordered main engine with full steam to head the vessel up to chains. Vessel acting nicely, shipping no water. 7 p. m., blowing a hurricane from N. N. E. Glass, 28.80 and going down continually; thick and rain.

Thursday, August 17.—Still the same. Sounded; got 30 fathoms. Ship at station with all possible steam to keep her up. 11 a. m., shipped a sea, stove port boat, broke fire-room ventilator, and after skylight stove in. 1 p. m., sounded, got 31 fathoms; glass, 28.70 and going down. 4 p. m., suddenly shifted to N. W., terrific; sounded, no bottom; sounded again and no bottom; concluded to slip chains and gave her all possible steam that could be had. 8 p. m., wind S. W.; glass, 28.60; judging my position 10 miles south by 10 miles east of station, shaped course N. by W.

Friday, August 18.—Glass, 28.60. Hurricane, S. E., terrific. At 3.30 a. m., thick and heavy, rain; could not see the length of the ship. Struck beach and went well up. At 5.30 Creed Hills life saving crew appeared; seas going completely over the vessel. At 6 a. m. all hands were landed in an exhausted condition; were taken to the station and well cared for, with dry clothing.

Saturday, August 19.—8 a. m., moderating; 9 a. m., returned to ship with all hands to look out for property.

Sunday, August 20.—Ship had been laying easy, but has thumped on ebb tide. She don't seem to be damaged much in hull.

Monday, August 21.—As there is no telegraphic communication, I send this by mail.

Very respectfully,

J. I. BOWLING,
Master Light-Vessel No. 69.

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The light-vessel arrived at Norfolk on September 23, from whence she was taken to Baltimore, where she will be repaired.

—. *Tail-of-the-Horseshoe light-vessel, entrance to Chesapeake Bay, Virginia.*—Congress, by act approved February 18, 1899, authorized the establishment of a light-vessel at this point. The Board will take the proper measures to place a light-vessel, already built, having a steam fog signal, on this station at an early date.

—. *Light-vessel No. 46.*—This steel light-vessel was built in 1887, is of about 200 tons burden, and has a steam fog-signal. At the commencement of the fiscal year she was laid up at the Portsmouth, Va., light-house depot. On September 15, 1898, the tender *Zizania* towed her to the Fourth light-house district, where she is still on duty.

—. *Light-vessel No. 16.*—This wooden light-vessel was built in 1854, is of about 250 tons burden, and carries a steam fog-signal. She was borrowed from the Third light-house district for the relief of light-vessel No. 49, on Cape Charles light-vessel station, while the latter was under repair; was towed to the buoy depot at Portsmouth, Va., by the supply steamer *Armeria* in April, 1899. She was prepared for being placed on Cape Charles light-vessel station by the crew of the tender *Maple* and was placed there on April 14, 1899. The boiler was found to have many leaky tubes which needed replacing, and, as this would cause too much delay, she was placed on the station, and her bell, struck by hand, was used in fog or thick weather. She was removed from this station on June 30 and sent in tow of the tender *Zizania* to the Fourth light-house district.

Relief light-vessel for the Fourth and Fifth light-house districts.—By the act approved July 1, 1898, an appropriation of $95,000 was made for constructing, equipping, and outfitting, complete for service, a first-class steam light-vessel, with steam fog-signal. The plans for this vessel are now being prepared, and the work of her construction will be done under contract as soon as practicable.

FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

522. Cape Charles light-vessel, No. 49, entrance to Chesapeake Bay, Virginia.—This 12-inch steam whistle was in operation about 186 hours, and consumed some 32 tons of coal.

524. Cape Henry, south side of the entrance to Chesapeake Bay, Virginia.—This first-class steam siren was in operation some 417 hours, and consumed about 22 tons of coal.

555. Wolf Trap, Chesapeake Bay, Virginia.—This second-class Daboll trumpet, operated by a petroleum engine, was in operation some 248 hours, and consumed about 90 gallons of mineral oil.

623. Diamond Shoals light-vessels Nos. 69 and 71, off the outer shoals off Cape Hatteras, North Carolina.—A 12-inch steam whistle was in operation 131 hours, and consumed about 5½ tons of coal.

DAY OR UNLIGHTED BEACONS.

The day beacons in this district are generally in fair order. They consist of six old light-house towers, three screw-pile structures surmounted by pyramids and balls, and one wooden mast provided with a ball.

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POST AND BEACON LIGHTS.

The service rendered by these small and inexpensive lights has been greatly appreciated, and there is a demand for the establishment of new ones in the rivers and bays of this district.

—. *Western Branch beacon light, Virginia.*—A structure has been erected at the entrance to the Western Branch of the Elizabeth River, Norfolk Harbor, and the light will be established there on July 1. A temporary light was shown during June from the structure.

—. *James River post lights, Virginia.*—The lighting of this river by post lights having been authorized by the act of Congress approved March 3, 1899, an examination will soon be made and a plan formulated for carrying out the provisions of the law.

BUOYAGE.

The buoy tenders have cared for the buoyage of the district during the year, excepting the stakes in Core Sound and the buoys in Bogue Inlet, North Carolina, and as one tender was used by the Navy for the greater part of the year, buoys out of position were not replaced as promptly as was desirable, but it was always done as soon as practicable. The stakes in Core Sound, North Carolina, were replaced and painted by hired labor in May, 1899. The water of Core Sound being too shallow to enable the buoy tenders to care for the stakes, etc., a contract was made for their care during the next fiscal year. The winter of 1898–99 having been unusually severe, many buoys were displaced by running ice, but most of them were recovered, some being damaged.

DEPOTS.

Lazaretto Point, Baltimore, Md.—Various repairs were made.

The following recommendation, made in the Board's last nine annual reports, is renewed:

> Attention is invited to the necessity of providing a dwelling at this depot for the accommodation of the depot keeper and his family. Their quarters in the warehouse are unsuitable and uncomfortable, and even were the rooms not required for other purposes it would cost nearly as much to make them comfortably habitable as it would to build a new dwelling. About one-third of the space on the upper floor is reserved for the use of custom-house inspectors, and the large and increasing amount of work on hand in the district demands the use of all storage and shop room available. The depot keeper must be constantly on the spot, and can not live away from the premises. There is ample room on the Government tract for such a building as is required, and it can be built for $2,500. An appropriation of this amount is earnestly recommended.

Portsmouth, Va.—The old fence on the side was removed and the lot was graded. The kitchen was torn down and a new building 16 feet by 30 feet in plan was erected in its place. A dressed-picket fence was built from the dwelling to the summer kitchen, a brick walk was laid to connect the two, and a wooden walk was built along the side of the kitchen. A new platform was laid under the buoy shed about 21 feet by 30 feet in plan, for buoy chains. Another was built in the rear of the wharf about 32 feet by 71 feet in plan, for the same purpose, and a third, 3 feet by 45 feet in plan, in the storehouse next to the coal shed. Some 150 feet of 3-inch sheet piling was driven along the wall on the side of the coal shed near the street to make the foundation secure. The space between the rails of the tramway was filled in with plank for 400 feet with a width of 5 feet 2 inches. Ventilators were fitted to the storehouses. Two reels for fire hose were made, and three boxes with covers prepared for the water pipes. A file case, 9 feet long, was made for the custodian's office. The depot is in excellent condition.

Annapolis, Md.—The custodian's dwelling was repaired, the cistern house was renewed, new supports were made for the water tank, and 396 running feet of wooden walk was laid between the dwelling and storehouse.

Washington, N. C.—The roof over the cistern was reshingled, the pump was repaired, and 118 feet of drainpipe was laid. The roof of the general storehouse was reshingled.

TENDERS.

Maple.—This steel twin-screw steamer was built in 1892 and is of about 392 tons burden. She was in the naval service until September 10, 1898, when she was returned to the Light-House Service at Portsmouth, Va. She was made ready for duty, and on September 19, 1898, the officers and crew were transferred from light-vessel No. 69 to the *Maple* and light-vessel No. 69 towed to Baltimore for repairs. Such repairs as were absolutely necessary to the engines, boilers, and hull of the *Maple* were made, and on February 10, 1899, she was ready for duty. On February 2, while the boiler was being tested, the main steam pipe burst. In February the *Maple* made three trips to the Diamond Shoal light-vessel with coal, rations, and other supplies, and one trip to Cape Henry with coal for the fog-signal. In March she was employed in correcting the buoyage of the inlets on the coast of Virginia, but was much delayed by fog and bad weather. After this she took rations from Baltimore to other light-vessels, and then took light-vessel No. 49, after she was outfitted with new anchors and chains, etc., and on March 17, 1899, towed her to her station. On March 20, 1899, the *Maple* sailed again for Diamond Shoal light-vessel, and after delivering coal went to Beaufort, N. C., and worked the buoys in the harbor and inlet. From March 27 to April 9, 1899, she was engaged in buoy work in the lower part of Chesapeake Bay and tributaries, and from April 10 to April 14 she was engaged in preparing light-vessel No. 16 for relieving light-vessel No. 49, and then placed her off Cape Charles, Va., and towed light-vessel No. 49 to Baltimore. From April 26 to May 31 the *Maple* was working the buoys in Chesapeake Bay and tributary rivers, and on June 1 she took coal to Diamond Shoal light-vessel. On this trip the inspector inspected light-vessel No. 69, Cape Lookout, North Carolina, and other outside lights, and on the return passage placed a gas buoy at the entrance to Chesapeake Bay to mark the wreck of the barge *Caravan*. From June 8 to June 15 the *Maple* was engaged in buoy work in Chesapeake Bay, and on June 24 she towed light-vessel No. 49 from Baltimore to her station off Cape Charles. During the four months and a half that the *Maple* was engaged in light-house work she steamed some 6,237 miles on a consumption of about 650 tons of bituminous coal. During this time she was employed 6 days on inspection duty, 70 days in working buoys and tending light-vessels, 17 days in delivering supplies and rations to light-stations, and 43 days at depots coaling, loading supplies and buoys, and doing other necessary work. She was under repair 136 days. She worked 400 buoys, visited 11 light-stations, delivered 205 tons of coal and 6 cords of wood to light-stations and vessels, furnished rations to 6 stations, transported

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the inspector to 6 stations for inspection, and the crew was employed 25 days at the buoy depots.

Violet.—This wooden side-wheel steamer was built in 1861 and is of about 266 tons burden. She was employed in inspection, supply, and buoy work during the greater part of the year. The hull, engine, and boiler were overhauled and put in good condition by contract. Her woodwork was cleaned and painted by her crew in April. She supplied all the light-stations on the sounds and rivers of North Carolina with annual supplies, rations, fuel, and oil, and attended to the buoys in those waters. During the year she steamed about 10,701 miles on a consumption of some 517 tons of bituminous coal. She was employed 25 days delivering fuel, rations, and supplies to light-stations, 54 days at depots, coaling, loading supplies and buoys, and doing other necessary work, and was 64 days under repair. She worked 526 buoys, visited 142 light-stations and vessels, delivered about 232 tons of coal and 125 cords of wood to stations and vessels, supplied 19 light-stations with rations, inspected 81 light-stations, delivered 2,218 cases of mineral oil, and the crew was employed 5 days at buoy depots cleaning and painting buoys.

Holly.—This iron side-wheel steamer, sheathed with wood, was built in 1881, rebuilt in 1898, and is of about 340 tons burden. She was received from the contractor in September, 1898. Since then she has been on inspection and supply duty and in working buoys. She steamed some 12,178 miles on a consumption of about 828 tons of bituminous coal. She was employed 134 days on inspection duty, 60 days in working buoys and attending to light-vessels, 45 days in delivering fuel, rations, and supplies to stations, 10 days at depots, coaling, loading supplies and buoys, or doing other necessary work, and was 30 days under repairs. She worked 216 buoys, visited 262 light-stations, delivered 98 tons of coal and 76 cords of wood to stations and vessels, furnished 32 stations with rations, and inspected 262 stations.

Steam light-vessel, No. 69.—From July 1 to September 18, 1898, this vessel was used as a light-house tender and was employed in the work of the district, manned by the officers and crew of the tender *Maple.* She was used for supply work and took the place of the supply steamer *Armeria,* bringing the annual supplies from the general light-house depot at Staten Island, New York, and distributing them among the stations in this district. While in this service she steamed about 3,400 miles on a consumption of some 192 tons of bituminous coal. She was employed 34 days in working buoys and attending light-vessels, 60 days in delivering supplies and rations to vessels and stations, and 30 days at depots, coaling, loading supplies and buoys, and doing other necessary work. She worked 2 buoys, visited 87 light-stations, delivered 313 tons of coal and 17 cords of wood to light-vessels and stations, and supplied 4 stations with rations.

Bramble.—This steel twin-screw launch was built in 1879 and is of about 30 tons burden. She was employed in attending to the gas-lighted beacons in the sounds of North Carolina, and in so doing was under way 1,148 hours and steamed about 1,325 miles on a consumption of some 39 tons of bituminous coal. During the year 98,050 cubic feet of gas were made at the gas plant and transported by the *Bramble* to the different lighted beacons, and only five of these lights were reported out from various causes. In June the *Bramble* was taken to Portsmouth, Va., and hauled out, when her hull was repaired, the bottom was cleaned and painted, and the engine and boiler overhauled. She is now in bad condition and can not last much longer for service, as her plates and beams are badly corroded and she is not worth the cost of her repair.

Jessamine.—This iron side-wheel steamer was built in 1881 and is of about 315 tons burden. She was employed during the year in installing new model lamps at 52 light-stations; in the inspection of 73 stations; in making borings and locating the sites of Hooper Island light-house, Maryland, and Western Branch Beacon, Elizabeth River, Virginia; in testing fog-signals at Wolf Trap, Old Plantation Flats, and Cape Henry, Virginia; in putting up new lenses at Stingray Point, Virginia, and Wade Point, North Carolina, light-stations; in an examination by members of the Light-House Board of Diamond Shoals, off Cape Hatteras, North Carolina, and in buoying a wreck on Tail of the Horseshoe, Virginia. She assisted in repairs and improvements at 18 light-stations and in the attempt to sink a disk pile at the site of the Baltimore light-station, Maryland. She was laid up forty-one days for necessary repairs to boiler, engine, guards, and steering gear. During the year she steamed about 8,530 miles with a consumption of some 631 tons of coal.

Thistle.—This wooden screw steam launch was built in 1890 and is of about 32 tons burden. She was engaged in towing barges carrying materials and working parties and in this way assisted in the repair of 22 light-stations; in the erection of Western Branch, Virginia, Alligator River and Blockade Shoal, North Carolina, beacons, and in the rebuilding of beacons Nos. 1 and 3, Rock Hall Creek, Maryland. In the spring of 1899 her hull, boiler, and engine were thoroughly repaired. During the year she steamed about 5,175 miles and consumed some 200 tons of coal.

The two scows used for transportation of materials, the pile driver and the scow upon which it is mounted, the working boat and the flat boat for general service were all put in thorough order. The pile driver and scow received extensive repairs.

6

SIXTH DISTRICT.

t extends from, but does not include, New River Inlet,
a, to and including Jupiter Inlet light-station, Florida.
ll aids to navigation on the seacoasts, bays, sounds, har-
and other tidal waters of North Carolina, South Carolina,
Florida between the limits named.

—Commander C. H. Arnold, United States Navy, to March
j. E. H. Ruffner, Corps of Engineers, United States Army,
1899; since then Commander John A. Rodgers, United
.

—Maj. E. H. Ruffner, Corps of Engineers, United States

strict there are—

and beacon lights, including 112 post lights	194
in position	3
hted beacons	40
operated by steam	2
operated by clockwork	3
uoys in position	7
n position	12
in position	293
staria, buoy tender, and for inspection and supply	1
haros, for construction and repair	1
unch *Water Lily,* for inspection and supply	1
unch *Snowdrop,* for construction and repair	1

LIGHT-STATIONS.

pe Fear, seacoast of North Carolina.—An appropriation for a
er light-house, to be built on the pitch of Cape Fear, Smith
North Carolina, having been made by the act approved July 1,
nd authority given to contract to an amount not exceeding
, a survey was made in September, 1898, on Smith Island and a
20 acres was selected, with right of way, along which a tram-
e was located, connecting the site with the Cape Fear River.
ng made indicated a good foundation for the tower. Legal
es are being taken to procure a title to the selected site.

following recommendation, made in the Board's last annual report,
wed:

> e sundry civil appropriation act approved July 1, 1898, an appropriation of
> was made for establishing a first-order light-station at or near the pitch of
> ear, North Carolina, and authority was given by the same act to contract for
> n in a sum not to exceed $70,000. As soon as a proper site can be secured
> ements will be made for its construction. It is estimated that $35,000 will be
> to satisfy the contracts made under the authority given in the above-named
> priation, and it is recommended that an appropriation of $35,000 be made
> or.

. *Range lights for dredged channels in the Cape Fear River, North*
olina.—The following recommendation, made in the Board's last
n annual reports, is renewed:

> e Board recommended the discontinuance of 10 of the present post lights in the
> er part of the Cape Fear River and the establishment of 24 new post lights,
> ch, in connection with certain other ranges already established, would constitute a

Sixth District.

system of ranges to guide vessels from the Cape Fear entrance to Wilmington, N. C., through channels dredged to a depth of 20 feet at mean low water. As vessels are now carried by ranges one-half the distance between the entrance and Wilmington, and then left without further adequate guidance, the Board is of opinion that to complete the usefulness of the aids to navigation in the lower part of the river similar aids should be provided to guide them to their port of destination. It is estimated that this can be done at a cost not to exceed $3,105, and it is recommended that an appropriation of that amount be made for this purpose.

These channels have already been dredged to the depth of 18 feet.

690. Georgetown light-station, South Carolina.—A war telephone line to connect it with a telephone station on South Island, which communicates with Georgetown, S. C., was built and is in good working condition.

699. Bull Bay, South Carolina.—A deed to the site selected for the light has been made and recorded, and the purchase is completed.

700. Charleston, South Carolina.—About 1,000 running feet of plank walk destroyed by storm was rebuilt, and repairs were made which were equivalent to about 500 feet more.

—, —. *Morris Island, north and south ranges, South Carolina.*—One of the beacons, carried away by storm tides, was rebuilt, and about 1,300 running feet of new plank walk was built. Both beacons have been discontinued.

703. St. Philips Church, rear beacon of main channel range, South Carolina.—A locomotive head-light lantern of the new type was put up and an electric burner was substituted for the gas jet.

704, 705. Mount Pleasant range, Charleston Harbor, South Carolina.—Moultrieville beacon No. 2 was converted into a front beacon for this range, and a new beacon, with focal plane 28 feet above high water, was built near the old Mount Pleasant No. 6 beacon. Each beacon carries a lens-lantern showing a fixed white light.

702. Fort Sumter, front beacon of the main channel range, and fog-bell station, South Carolina.—The keeper's dwelling, which is located on the parapet of the fort, was moved 55 feet nearer to the beacon, and the lightning conductors of both beacon and fog-bell were renewed.

706, 707. South Channel Range, South Carolina.—The rear beacon, which was common to both ranges, has been discontinued, but the two front beacons constitute a range to lead from the Mount Pleasant range, through the South Channel, to Charleston. Minor repairs were made.

715, 716, 717. Wadmelaw River beacons, South Carolina.—Slight repairs were made to these beacons. Nos. 1 and 3 are in good condition. No. 2 was carried away by rafts, and has not yet been replaced.

718. Hunting Island, South Carolina.—The causeway connecting the boat landing with the main line was restored and the tramway line to the tower was repaired.

720, 721. Hilton Head, South Carolina.—The structures at the front beacon were injured by the storm of October, 1898. Seven new piers were put under the dwelling and the storehouse was rolled back into position. The roadway between the structures was repaired, the bridges were replaced, and various repairs were made.

722, 723. Paris Island, South Carolina.—About 1,400 running feet of plank walk destroyed by the storm of October was rebuilt. Various repairs were made.

724. Skull Creek beacon, South Carolina.—A three-pile beacon carrying a white light, with focal plane 16 feet above mean high water, was built in 8 feet of water to mark the entrance to Skull Creek, South Carolina.

Sixth District.

725, 726. Daufuskie Island, South Carolina.—The boat landing and approach 360 feet long was almost entirely renewed; also 1,620 feet of fencing and, at the front beacon, 300 feet of plank walk. Various repairs were made.

727, 728. Bloody Point, South Carolina.—The front beacon of the range suffered from the storm of October, 1898. The foundations of the dwelling were filled in and boarded up, and various repairs were made. Under an appropriation of $2,700, made by the act approved on March 3, 1899, a contract has been made for removing the structures of the front beacon to the site of the rear beacon.

731, 732. Jones Island range beacons, South Carolina.—The boat landing, boat shed, and about 1,300 feet of plank walk were rebuilt. The locomotive headlight lantern of the rear light, which is nearly worn out, will be replaced by one of the new type three-day brass lanterns.

733. Cockspur Island, Georgia.—Some 50 feet of the boat landing was repaired and it was extended about 26 feet into the channel. The whole superstructure of the boat landing at the beacon was rebuilt.

734, 735. Oyster Beds light-station, Georgia.—In July the superstructure of the front beacon was burned and the lens-lantern was lost. A new lantern was provided, the light was reestablished, and in August the beacon was rebuilt. A boathouse and landing place on Cockspur Island was built on piles sheathed with yellow metal, and 65 feet of the superstructure of the boat landing at the rear beacon was rebuilt.

736, 737. Tybee Knoll Cut, Georgia.—This station suffered severely from the storms of September and October, 1898. The superstructure of the wharf was renewed, a boathouse and about 1,060 running feet of elevated plank walk was built. Various repairs were made.

738. Long Island east beacon, Georgia.—A boat landing on metalled piles, with connecting plank walk 165 feet long, and a lamp house at the base of the beacon were built.

740. Venus Point, South Carolina.—Some 400 running feet of plank walk were rebuilt. The discontinued iron front beacon is to be moved and made the front beacon of the Bloody Point Range. Various repairs were made.

742, 743. Elba Island, Georgia.—The site was literally buried in sedge brought by the storm tide of October, 1898, which covered the whole island. This was removed. The boat landing was repaired with 125 feet of plank walk. New lantern decks were put up for the beacons. The new type of brass locomotive headlight lanterns received a long test here and were found to be satisfactory.

751, 752. Fort Jackson range, Georgia.—A boat landing with 175 feet of plank walk was built.

755. St. Catherines Sound, Georgia.—Condemnation proceedings for the acquirement of title to the approved site on St. Catherines Island are still awaiting the decision of the United States court.

756. Sapelo, Georgia.—The storm of October, 1898, was particularly severe along the coast from Sapelo to Fernandina. At Sapelo the water covered the floor of the second story of the dwelling and submerged the top of the roof of the oil house. The dwelling had one gable end undermined and washed away and the interior gutted. The dwelling was practically rebuilt, the oil house was repaired, and a boat house was provided. Various repairs were made. In February the front beacon was dismantled and the range discontinued.

—. Wolf Island, Georgia.—This station suffered almost as much as Sapelo. The front beacon was rebuilt and moved 28 feet to the south-

Sixth District.

ward to conform to the new channel. The boat landing and boathouse were replaced and about 1,388 feet of plank walk was built. Various repairs were made. In February the range was discontinued and the boathouse was transferred to the Sapelo light-station.

757, 758. St. Simon, Georgia.—The front beacon, destroyed by the storm, was rebuilt, the front steps of the dwelling and the work between the piers were renewed, and a new boathouse was built. Some 340 feet of wire fence and 890 feet of picket fence were renewed and 510 feet of picket fence repaired.

759, 760. Plantation Creek range, Georgia.—The rear beacon was injured by fire and was practically rebuilt. The lantern decks and pedestals of both beacons were covered with sheet iron as a protection against fire.

761, 762. Jekyl Island range, Georgia.—The front beacon of this range was injured by storm and fire and was rebuilt. The lantern decks and pedestals of both beacons were sheathed with sheet iron as a protection against fire.

763, 764. Colonels Island range, Georgia.—The front beacon of this range, which had been injured by storm and fire, was rebuilt. The lantern decks and pedestals of both beacons were covered with sheet iron as a protection against fire.

—. *The inside passage from Savannah, Georgia, to Fernandina, Florida.*—In its last ten annual reports the Board recommended that it be empowered to erect and maintain 25 post lights, in order to facilitate the navigation of the inland passage from Savannah to Fernandina, at an estimated cost of $4,000. An appropriation of this amount has been recommended. This recommendation is renewed.

766, 767. Tiger Island north range, Florida.—This range suffered severely from the storm of October. A new front beacon, a wooden oil house, and some 1,440 feet of plank walk were built.

768, 769. Tiger Island south range, Florida.—A front beacon, a wooden oil house, and 180 feet of plank walk were built.

770. Amelia Island range, Florida.—The front beacon of this range was rebuilt after the storm of October, 1898. The range was discontinued in May, 1899.

771. St. Johns River, Florida.—The front light of the Mayport range was transferred to a point on this light-house site. With the St. Johns River light as a rear beacon they make a range to take the place of the Mayport range. It is known as the Mayport range. Slight repairs were made.

774. Mayport range, Florida.—The front beacon of this range was moved to a point on the St. Johns River light-house site to make a range with the St. Johns River light-house as a rear beacon to make it lead through better water. The rear beacon was discontinued. The new range is known as the Mayport range.

—. *Reimbursement of light-keepers for personal losses sustained during the cyclones of August 27 and 28, 1893.*—The following statement, made in the Board's last five annual reports, is repeated:

> A number of keepers of light-houses, the officers and crew of a light-vessel, and the keeper of a buoy depot sustained more or less heavy personal losses when the stations where they were employed were wrecked. Many of them displayed much devotion to the service and incurred great personal danger.
>
> The Board therefore brought these matters to the attention of the honorable Secretary of the Treasury, and he, in letters of November 9 and 16, 1893, and January 29, 1894, to the Speaker of the House of Representatives, transmitted the sworn statements of each keeper as to his losses, indorsed by Commander M. R. S. Mac-

kenzie, United States Navy, inspector of the Sixth light-house district, and recommended that provision be made by Congress for the reimbursement of the losses sustained by these keepers. The losses, as shown in these statements, amount to $2,399.13. Recommendation is made that an appropriation of that amount be made for the reimbursement of losses sustained by the light-house employees in the Sixth light-house district.

Similar losses were sustained by light-keepers in the Eighth light-house district during the hurricane of October 1, 1893. Statements of the losses they sustained, duly approved and indorsed by the light-house inspector, were sent to the Speaker of the House of Representatives by the Treasury Department in its letters of January 29, March 7, and April 3, 1894, with recommendation that reimbursement be made. The sum of these losses, as stated, amounts to $2,603.62. Recommendation is made that an appropriation of this amount be made for the reimbursement of the losses sustained by light-house employees in the Eighth light-house district.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

698. Cape Romain, S. C.
729-730. Tybee, Ga.
741. Jones Island beacon, S. C.
747, 749. Oglethorpe range, S. C., and Ga.
770. Amelia Island, Fla.
863. St. Augustine, Fla.

LIGHT-VESSELS.

667. Frying Pan Shoals light-vessel No. 1, seacoast of North Carolina.—This wooden light-vessel was built in 1885, is of about 275 tons burden, and has a steam fog-signal. On May 3, 1899, she was brought to Charleston for repairs, and relief light-vessel No. 29 was placed temporarily on her station. She was hauled out and her bottom was patched, new metal was put on her water line, the rolling chocks, sternpost, and rudder were repaired, and new graven pieces put in her planking. The starboard hawse pipe was taken out and renewed and the starboard davits were repaired. New chain plate for the main backstay, new smokestack, new iron casing for the smoke box, and new ash-pan door were supplied, the boiler feed pump was repaired, a new fork for the signal lever, a new valve rod for the hoister, new studs for the seacock were supplied, spool on the hoister was bored and fitted, the steam gauges were tested, and various other repairs were made. She was replaced on her station on June 26, 1899, and relief light-vessel No. 29 was brought to Charleston.

701. Charleston light-vessel No. 34, off Charleston Harbor, South Carolina.—This wooden light-vessel was built in 1864, is of about 152 tons burden, and has a bell for a fog-signal. As this vessel has not been out of the water for over five years, she will go on the ways and have her copper thoroughly patched and renewed where necessary, when practicable.

719. Martins Industry light-vessel No. 53, off the seacoast of South Carolina.—This steel steam light-vessel was built in 1892, and is of about 310 tons burden. She was recently repaired and was replaced on her station on August 20, 1898.

NOTE.—She was brought to Charleston July 15, 1899, for repairs, and Relief light-vessel No. 29 was placed temporarily on her station.

Relief light-vessel No. 29.—This wooden light-vessel of about 232 tons burden, old measurement, was built in 1864. She has a bell for a fog-signal. She is kept at Charleston for use as a relief vessel. On August 20, 1898, she was brought in from Martins Industry Shoal; on May 3, she relieved light-vessel No. 1 on Frying Pan Shoals, and was brought to Charleston June 26, 1899, when light-vessel No. 1 was returned to her station. One of her boats was repaired, her davits were straightened, and a copper smokestack for the galley was supplied. As she has not been out of the water for over five years, she will go on the ways and have her copper patched or renewed where necessary, when practicable.

NOTE.—On July 15 she relieved light-vessel No. 53 at Martins Industry Shoal, when that vessel was brought in for repairs.

DAY OR UNLIGHTED BEACONS.

There are in this district 40 day or unlighted beacons, most of which are in good condition.

FOG-SIGNALS OPERATED BY STEAM.

667. *Frying Pan Shoals light-vessel No. 1, seacoast of North Carolina.*—This 12-inch steam whistle was in operation about 140 hours, and consumed some 9 tons of coal and about 1 cord of wood.

719. *Martins Industry light-vessel No. 53, seacoast of South Carolina.*—This 12-inch steam whistle was in operation some 294 hours, and consumed about 24 tons of coal and about 1 cord of wood.

BUOYAGE.

The buoyage is in good condition. Every buoy was relieved. About half of the buoys were relieved in the fall after the cyclone season and the balance in the spring months. All the buoys in the New or West Channel, Winyah Bay, and Georgetown Harbor entrance, and all the buoys in the Old Main Channel, Charleston, South Carolina, to and including South Jetty bell buoy, were discontinued. The Swash Channel into Charleston was renamed Main Channel. Seventeen buoys were discontinued, 5 were established, and 1 was replaced. The position of 6 buoys were changed, the color and number of 4 were changed, and 18 buoys were recovered. Repairs were made to 50 buoys. Some 15 third-class sinkers, 2 ballast balls, and 6 buoy disks were purchased in the district, and 150 fathoms 1 inch, 450 fathoms 1¼ inch, 180 fathoms 1½ inch buoy chain, 1 bell buoy complete, 11 second-class, 6 third-class nun, 6 second and 6 third class-can, 12 steel balls for bell buoys, and 50 third-class shackles were received from the general light-house depot.

DEPOTS.

—. *Castle Pinckney, Charleston Harbor, South Carolina.*—Sixteen piles, sheathed with yellow metal, were driven under the wharf and 27 fender piles on the head and sides. Some 30 stringers were put in and about 2,000 square feet of new decking was laid. The dwelling was reshingled, seven doors and two pairs of blinds were furnished and hung, the plastering of two rooms and the guttering of the dwelling and storehouse were repaired, and additional protection against lightning was provided on the storehouse.

—. *New depot for Sixth light-house district.*—An appropriation of $35,000 was made by the act approved March 3, 1899, for purchasing a site and establishing the depot. Efforts have been made to procure a suitable site at a cost which would leave funds for the construction of the necessary wharves and buildings for a depot, but so far without success. These efforts will be continued.

TENDERS.

Wistaria.—This iron side-wheel steamer was built in 1881–82 and is of 252 net tons burden. She replaced and relieved 312 buoys, repaired 17, recovered 9, changed and repainted 384 buoys, repaired 119 buoy chains, put new disks on 8 bell buoys, new chafing fenders on 6 whistling buoys, and was employed at the depot 19 days. During each quarter she supplied the light-vessels with fuel and rations and transported the inspector at various times to inspect the stations. She towed light-vessel No. 53 to Martins Industry light-station and brought light-vessel No. 29 in; she also towed light-vessel No. 29 to Frying Pan Shoals and brought light-vessel No. 1 to Charleston, afterwards returning light-vessel No. 1 to her station and bringing light-vessel No. 29 to Charleston. She steamed about 11,400 miles and consumed some 916 tons of coal and 7 cords of wood. She was in motion 50 days, some 254 days under steam, and about 111 days without fire. She had steam on her donkey boiler 47 days. She was hauled out, scraped and painted twice during the year, and minor repairs were made to her pumps, boiler, fire tools, rudder, circulator pump, woodwork, and bilge pipes. She is in need of considerable repairs, and a survey has been held by the superintending engineer, who has recommended that she be repaired; specifications are now in the hands of bidders, and the work will be done after the cyclone season. Her 24-foot naphtha launch was of great assistance, and is still quite useful in inspection work, sounding channels, and as a means of reaching the depot while in dock.

Pharos.—This wooden schooner, which was purchased in 1854 and rebuilt in 1872, is of about 138 tons burden. She was during the war with Spain detailed as a torpedo guard boat, from which duty she was relieved about September 1, 1898. She was docked and then engaged in a survey for site of Cape Fear, North Carolina, light-station. She made repairs to light-stations in the Savannah River at Sapelo, Wolf Island, Hilton Head, Daufuskie, Long Island east beacon, Venus Point, Jones Island, and Oglethorpe range beacons, and the dwelling at Castle Pinckney depot. She worked the new Mount Pleasant range, built the Skull Creek beacon, and prepared to go into dry dock for overhauling.

Launch Water Lily.—This wooden 65-foot twin screw naphtha launch was built in 1895, and is of about 19 tons burden. She steamed about 6,257 miles and consumed some 9,109 gallons of naphtha. She inspected 52 light-stations and all the post lights and beacons in the St. Johns River, Florida; rebuilt 38 post lights and beacons, repaired 21 and repainted 57 post lights. She relieved and replaced buoys in localities where the depth of water did not allow the tender *Wistaria* to go. She was laid up about three months, receiving two new engines and in having new galley fitted up, new tanks, and various other repairs and alterations to her woodwork, the greater part of which was done by the crew. Her new engines use about half the quantity of naphtha consumed by the old engines.

Launch Snowdrop.—This wooden naphtha launch was built in 1896, and is of 19 tons burden. During July and August, 1898, she was detailed for duty near Port Royal with the United States Engineer

Department. She made repairs to stations on the Savannah River, Paris Island, St. Simon beacon, Amelia Island, Tiger Island north and south ranges, St. Simon light-stations, and all the Brunswick Harbor beacons. She built the new Mayport front beacon. For a month she was on inspection duty between Georgetown and Charleston. She built the Sampit River beacons, repaired Cape Romain light-station, and then went on the marine railway to have her copper sheathing patched and her machinery repaired.

WAR TELEPHONE LINES.

A war telephone line was built between Georgetown light-station and South Island, South Carolina, where it was connected with a telephone line to Georgetown. A line was built from Charleston light-station to Charleston, S. C. A line was built between Hilton Head light-station and the Port Royal naval station, South Carolina. A line was built between Amelia Island light-station and Fernandina, Fla., which has been abandoned as useless. A line was built between St. Augustine light-station and St. Augustine, Fla. A contract was made in July, 1898, for the construction of a line between Cape Canaveral light-station and Oak Hill, Fla., but not being completed at the end of the Spanish war, the contract was forfeited and the line was abandoned.

SEVENTH DISTRICT.

is district extends from a point just south of Jupiter Inlet light-
on to and including Perdido entrance, Florida. It embraces all
to navigation on the sea and Gulf coasts of Florida, and on other
waters tributary to the sea and Gulf between the limits named.
pector.—Lieut. Commander C. C. Cornwell, United States Navy,
ctober 15, 1898; since then Lieut. Commander Nathaniel R. Usher,
ed States Navy.
gineer.—Lieut. Col. A. N. Damrell, Corps of Engineers, United
tes Army.
here are in this district—

ht-houses and lighted beacons	59
or unlighted beacons	59
istling buoys in position	3
buoys in position	5
er buoys in position	289
amer *Laurel*, buoy tender, and for supply and inspection	1
amer *Mangrove*, buoy tender, and for supply and inspection	1
amer *Arbutus*, for construction and repair in the Seventh and Eighth districts.	1
ooner *Clover*, for construction and repair in the Seventh and Eighth districts.	1

LIGHT-STATIONS.

—. *Hillsboro Inlet, off Hillsboro Point, between Jupiter Inlet and Fowey
ocks lights, Atlantic coast of Florida.*—The following recommendation,
hich has been made in several previous annual reports of the Board,
renewed:

> The establishment of a light at or near Hillsboro Point, Florida, would be of great
> sistance to all vessels navigating these waters. Steamers bound southward, after
> aking Jupiter Inlet light, hug the reef very closely to avoid the current. The dan-
> erous reef making out from Hillsboro Inlet compels them to give it a wide berth
> d to go out into the Gulf Stream. Vessels coming across from the Bahama Banks
> ould be able to verify their position if a light were placed here—a difficult matter
> case they fail to make Jupiter Inlet. The establishment of this light would com-
> lete the system of lights on the Florida reefs. The Board therefore renews the
> ecommendation that $90,000 be appropriated for this purpose.

868. Hen and Chickens Shoal beacon, Florida.—A square, wooden, pyramidal beacon, painted red, with letters "H. & C." in white on four sides of base of platform, was built about 100 feet ENE. from Hen and Chickens buoy No. 10, in Hawk Channel between Key West and Miami, Fla. The piles of beacon are covered with cast-iron pipes filled with cement mortar. It faces square with the channel, and stands in 18 feet of water at high tide. Height of focal plane above mean sea level is 31 feet. When installed the beacon will bear a red 5-day lens-lantern light.

869. East Turtle Shoal beacon, Florida.—A lighted beacon was built under contract on East Turtle Shoal, in 13 feet of water, 720 feet NNW. from East Turtle buoy. It is a square, pyramidal, wooden structure, painted black, with the letters "E. T." in white on four sides of base of platform. The four supporting piles are covered by iron-pipe sleeves filled with cement mortar. The beacon faces with and at right angles to the course of vessels to Key West through Hawk

Channel, SW. by W. ½W. When installed this beacon will bear a white 5-day lens-lantern light, the focal plane of which will be 31 feet above mean sea level.

870. East Washerwoman Shoal beacon, Florida.—A lighted beacon was built under contract on East Washerwoman Shoal, about 200 feet SW. ⅛W. from a buoy on the easterly end of the shoal, in 10 feet of water. It is a square, pyramidal, wooden structure, painted black, with the letters "E. W." in white on four sides of the base of the platform. The four supporting piles are covered by cast-iron sleeves filled with cement. When installed the beacon will bear a white 5-day lens-lantern light, the focal plane of which will be 30 feet above mean sea level.

874. Sombrero Key, on Sombrero Shoal, Florida Reefs, Florida.—The iron work of this entire station was scaled, scraped, and painted from dome to water's edge. Various repairs were made.

875. American Shoal, Florida Reefs, Florida.—A new oil house, 14 by 14 by 7 feet, was built and hung on iron rods under the tower. The entire tower from dome to water's edge was given one coat of paint, the oil house and cisterns were given two coats. Various repairs were made.

876. Sand Key, near Key West, Gulf of Mexico, Florida.—The iron work of the tower was scaled, scraped, and painted from the dome to the ground under the tower. It was given one coat of red lead and one of mineral brown. The dwelling was given two coats of mineral brown. All of the new work—partitions, blinds, lockers, etc.—were appropriately painted. The boathouse was taken down and moved to 5 feet of water and rebuilt, with a new shingle roof. A wharf, 105 feet long, leading out to it, was built. The wharf rests on wooden piles, protected by yellow metal. Various repairs were made.

877. Key West, Gulf of Mexico, Florida.—Some 843 feet of fencing was replaced and 191 feet of the old fence was repaired. The entire fence was painted, the gates with two coats. The ground around the base of the fence was graded and the débris was removed. Some 90 running feet of ridge tiles were repointed with cement mortar. Various repairs were made.

880. Northwest passage, on the flats to mark the channel leading to the northwest channel over the bar, Florida.—A new oil house was built and hung on the iron rods under the dwelling; it was ceiled inside, furnished with a door, and the entire structure was painted. A platform was built to connect it with the ladder leading up to the dwelling. Various repairs were made.

881. Rebecca Shoal, in 12 feet of water on the southeast edge of Rebecca Shoal, Florida.—The iron work was scaled, scraped, and painted two coats. The iron gallery railing of dwelling, 180 feet long, was thoroughly repaired, scraped, and painted two coats. Various repairs were made.

882. Dry Tortugas, on Loggerhead Key, the westernmost key of Tortugas group, Florida.—The iron work of the tower was thoroughly scraped, scaled, and given two coats of paint from the top of the dome to the bottom of the tower. New storm doors were made and put in; five windows were fitted with new frames and storm windows. The watchroom was ceiled and painted. An addition 10 feet long was made to the boathouse. New floors were laid throughout the house. The roof was thoroughly repaired, one entire side being supplied new.

Walks were constructed leading from the kitchen to the washhouse and main building. Various repairs were made.

883. Tortugas Harbor, Fort Jefferson, Garden Key, Tortugas group, Florida.—Some 212 feet of brick walks were laid. Some 455 feet of iron fence was scaled, scraped, and painted. The washhouse and chicken house, under one roof, were rebuilt from the ground up, including repairs to brick foundations. The ironwork of the tower was scraped, scaled, and painted two coats. Five broken storm pains in the lantern were replaced, and various repairs were made.

884. Sanibel Island, entrance to San Carlos Harbor and port of Punta Rassa, Florida.—Materials for use in repairs were purchased and delivered.

886. Gasparilla Island (rear), entrance to the harbor, Florida.—Materials for use in repairs were purchased and delivered.

887. Charlotte Harbor, near the middle of the harbor, Florida.—Materials for use in repairs were purchased and delivered.

890. Egmont Key, entrance to Tampa Bay, Florida.—Materials for use in repairs were purchased and delivered, and the work was started late in June. Under special appropriation of $3,500 for a keeper's dwelling plans and specifications were prepared, and advertisement has been made for bids to do the work under contract.

894. Indian Hill, Tampa Bay, Florida.—The entire structure was painted and various repairs were made.

895. South Cut (lower) light, entrance to Old Tampa Bay, Florida.—This iron beacon was taken down, removed about 975 feet W. ½ N. from its old position and rebuilt in 22 feet of water about 25 feet from the edge of the cut, on the east side of the lower end of lower entrance to Old Tampa Bay, Florida. The height of focal plane of the light was reduced to 31 feet 6 inches above mean sea level. Three clusters of three piles to the cluster were put on three corners of the beacon to act as fenders.

896. South Cut (upper) light, entrance to Old Tampa Bay, Florida.—The metal work for this beacon was purchased under contract, delivered in Mobile, Ala., and taken to the site of the work by a hired schooner. The beacon was erected by hired labor. It is a triangular iron structure resting on wooden piles incased in cast-iron sleeves filled with cement. It is located in 21 feet of water, about 50 feet from the east side of the upper end of the South Cut, in place of wooden pile beacon No. 8. The platform supports an iron column from which a fixed white five day lens-lantern light is suspended. It also supports a white lamp house. The balance of the structure is painted mineral brown. The focal plane of the light is 50 feet above mean sea level.

897. North Cut (lower) beacon, entrance to Old Tampa Bay, Florida.—This beacon was taken down, moved about 1,000 feet east from its old location, and rebuilt about 25 feet from the eastern edge of the lower end of the upper cut entrance to Old Tampa Bay, Florida, in place of wooden pile cluster beacon No. 10. It stands in 21 feet of water, and the focal plane of the light is about 31 feet 6 inches above mean sea level. Three clusters, each containing three piles, were driven to act as fenders on three corners of the beacon.

898. North Cut (upper) beacon, entrance to Old Tampa Bay, Florida.—A triangular iron beacon resting on wooden piles incased in cast-iron sleeves was erected by hired labor. The metal work was purchased under contract. The beacon stands in 22 feet of water about 50 feet from the eastern edge of the upper end of the upper cut entrance to Old Tampa Bay, Florida. The platform bears an iron column from which a fixed white five-day lens lantern light is suspended and a lamp house. The entire structure, except the lamp house, is painted mineral brown. The focal plane of the light is about 40 feet above mean sea level. Clusters of three piles each were driven to act as fenders on three corners of the beacon about 20 feet distant from the beacon.

902. Anclote Keys, on the south end of the most southerly of the Anclote Keys, Florida.—The hard-oil finish was scraped off the inside of the keepers' dwellings at this station, and two coats of white paint put on. The entire dwellings were given one coat of white paint on the outside. The latticework around the foundation of the dwellings was repaired and painted lead color. Various repairs were made to the keepers' dwellings. The ironwork of the light tower was scaled, scraped, and painted. The oil house was covered with galvanized iron, and the entire structure received a coat of mineral-brown paint. An extension was built to the wharf to bring it out to deep water, 200 feet long by 8 feet wide, with a T-head, 20 feet long by 5 feet wide, on outer end, with a ladder leading to the water on outer side and steps leading to the wharf on inner side. Two fender piles were driven on the outside of the T-head. An incline, 20 feet long by 8 feet wide, was built on the inner end of the wharf. The entire picket fence around the station was rebuilt with cypress. It is 5 feet high and 400 feet long, and is fitted with four gates. It has a water table and baseboard, and the ground around the bottom is graded. The entire fence received a coat of white paint. The opening between the kitchen and main dwelling was inclosed, thus making an additional room, which was floored, ceiled, and weatherboarded, and received two coats of paint on the outside. Various repairs were made.

905. St. Marks, entrance to St. Marks River, Florida.—The wharf was repaired and an incline built on inner end 6 feet wide by 65 feet long. Various repairs were made.

906. Carrabelle River, Bar Range Beacon (front), Florida.—A wooden lighted beacon was built. It is a black, triangular, pyramidal structure, supported by wooden piles, protected by terra-cotta pipe; its upper part is covered with horizontal slats. It is located off the easterly point of Timber Island, on the axis of the dredged channel at entrance to Carrabelle River. It bears a fixed red lens-lantern light, the focal plane of which is 18½ feet above mean high water.

907. Carrabelle River Bar Range Beacon (rear), Florida.—A wooden lighted beacon was built by hired labor and purchase of materials. It is a black, triangular, pyramidal structure, supported by wooden piles, covered by terra-cotta pipe; the upper part is covered with horizontal slats. It is located on the axis of the dredged channel at entrance to Carrabelle River, Florida, about 2,255 feet N. W. ⅜ N. in rear of the front range beacon. It bears a fixed white lens-lantern light, the focal plane of which is 32 feet above mean high water.

908. Crooked River (front), St. George Sound, Florida.—A hoisting wire rope was furnished.

909. Crooked River (rear), St. George Sound, Florida.—A cypress wharf 414 feet long by 8 feet wide and 5 feet 6 inches above water was built. It rests on 3-inch galvanized pipe piles with 7-inch flanges and has a T-head on the end 20 feet long by 8 feet wide. Three fender piles are driven on the outside of the T-head, which are coppered 12 feet above water. The boathouse was reconstructed. It stands 50 feet west of the T-head on coppered piles. It is boarded up and is covered at the joints with battens. It is 7 feet 6 inches in the story. The fencing was repaired and painted. A picket fence 502 feet long by 5 feet high was built in front of the station and a double gate was hung. The washhouse was thoroughly repaired, a new shingle roof put on it and minor repairs were made. The ironwork of the tower was scaled, scraped, and painted. Some 455 feet of plank walk 8 feet wide and another 406 feet long 4 feet wide and still another 222 feet long 2 feet wide were built. The roof of the oil house was painted mineral brown. The ventilators in upper part of keeper's dwelling were boarded up and received two coats of white paint.

912. Cape St. George, on Cape St. George, near Cape St. George Sound, Florida.—A wharf resting on iron pipe piles, 940 feet long, with a landing platform at the outer end and steps leading from the wharf to the landing platform and wharf to the ground at the inner end was built, and the boathouse was thoroughly repaired. The wharf is 8 feet wide. The light-tower was hacked all over, and repointed with cement mortar, after which it received two coats of whitewash. The storm of August 2, 1898, caused damages of a minor character, which were repaired by the working party then at the station.

915. Outer beacon, at the southern end and eastern edge of the dredged channel in Apalachicola Bay, Florida.—This structure, which was formerly a wooden day beacon, was repaired and remodeled so as to bear a light, and an ordinary lantern light was placed on it, focal plane of which was 36 feet above mean high water. It was found that the ordinary lantern light was not sufficiently strong for the purpose, and the top was altered, a hoisting apparatus fitted to it, and a five-day lens-lantern light was installed, which is giving satisfaction.

918. Cape San Blas, in the water at the south point of Cape San Blas, Florida.—After a careful consideration of all the conditions affecting the choice of a proper site, the Board has concluded that the light should be reconstructed on the shell ridge about 1⅝ miles N. by W. from its present location. It is estimated that this can be done at a cost not exceeding $15,000. The Board therefore recommends that an additional appropriation of this amount be made therefor.

919. St. Joseph Point, east side of St. Joseph Bay, Florida.—Under the appropriation of $15,000, for a light at the above-named location, soundings were made and borings of the bottom were taken to a depth of 26 feet, which was found to be compact sand mixed with shells and varying slightly in color. On account of the 5-fathom curve coming close in shore it was decided that the light be located at high-water mark on the beach near the point and inside the peninsula. An examination will be made to locate the light-house reservation on the end of the peninsula, reported to have been washed away in 1851.

—. *Reimbursement of a light-keeper for losses sustained during the gale of October, 1894.*—It appears that Mr. W. M. Quinn, while keeper of Cape San Blas, Florida, light-station, during the gale of October, 1894, lost all the property he had at the light-station. An itemized account, amounting to $124.75, was transmitted through the inspector of the light-house district, who recommends that the keeper be indemnified in the sum claimed by him. The Board therefore recommends that an appropriation of $124.75 be made for this purpose.

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REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

867. Fowey Rocks, Fla.
872. Carysfort Reef, Fla.
873. Alligator Reef, Fla.
893. Mullet Key Shoal, Fla.

SURVEYS.

The following-named surveys of light-house reservations were made:

Estero Island, Florida.—The eastern boundary line was surveyed, and the boundaries were established and marked.

Cape San Blas, Florida.—A survey was made; also at Black's Island to determine which point was the most advantageous for the location of the light tower, when removed from its present site.

St. Joseph Point, Florida.—A survey was made to select the most favorable point for the location of the light; borings were made and samples of the bottom were taken at the point selected.

Crooked River, Florida.—A survey was made to locate and plot the position of the light tower, keeper's dwellings and other structures.

DAY OR UNLIGHTED BEACONS.

Hawk Channel beacons, Florida.—Two day beacons were erected under contract, which are located and described as follows:

Biscayne Bay Beacon, No. 2, at entrance from Cape Florida Channel into Biscayne Bay, Florida.—A square, pyramidal, wooden beacon, upper part lattice work, resting on wooden piles covered with cast-iron sleeves filled with cement mortar; painted red and having No. 2 in white letters on four sides of the base of the platform. On three sides of the upper part the beacon bears a white shield, viz, facing channel from seaward on the turn of the channel from Miami, and on the side facing vessels coming from Miami. The shields are cut to the shape of a nun buoy. The beacon is 31 feet high above water.

Bache Shoal Beacon, No. 1, 25 feet west of the buoy off Bache Shoal and south of Bowles Bank, Florida.—A square, pyramidal, wooden beacon, upper part latticework, resting on wooden piles covered with cast-iron sleeves, filled with cement mortar. The beacon is painted black and has "B. S. No. 1" in white on four sides of the base of the platform. It is fitted with three shields painted white, cut to the shape of a can buoy, on the north, west, and south sides of the structure. It is 31 feet high above sea level.

Florida Reef Beacons, Florida.—The metal work for six iron spindle day beacons was purchased under contract, and a separate contract was made for the erection of the beacons. The structures consist of a wrought-iron pile shaft which is driven firmly into the bottom, after which a cast-iron disk is fitted to the pile shaft and rests on the bottom which is leveled off to make a smooth surface. A column is then fastened to the pile shaft, the upper part of the column bearing the letter vanes for the display of the distinguishing letter of the beacon.

Beacon R was built in about 10 feet of water on the Western Sambo Shoal. Beacon S was built in about 10 feet of water on Maryland Shoal. Beacon V was built in about 10 feet of water to mark the inside channel west of Fowey Rocks light station, in place of can buoy No. 1. Beacon T was built in 11 feet of water on Molasses Reef,

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Florida. Beacon U was built in 10 feet of water on Star Reef, Florida. Beacon W was built in 14 feet of water in place of Cape Florida red nun buoy. All of the beacons are painted mineral brown.

The four lighted beacons at Hen and Chickens Shoal, in place of buoy No. 10, East Turtle Shoal, East Washerwoman Shoal, and at Delaware Heads, near buoy No. 15 at Four Foot Shoal, have been erected, but have not been lighted. The buoys marking these spots have been removed.

The new beacons marking the upper South Cut and the upper North Cut entrance to old Tampa Bay, Florida, were completed and the lights displayed first December 15, 1898. The new beacons to mark the dredged channel, Carrabelle River Bar range, were completed and the lights displayed from them first on April 6, 1899. On the same date the old Carrabelle River Bar range lights and Timber Island beacon light were discontinued. The beacons remain as day marks. The Outer Beacon on the southern and western edge of the dredged channel to Apalachicola Bay was completed, and the light was first displayed on April 6, 1899.

BUOYAGE.

The following-named new buoys were established during the year: Cape Florida Swash Channel, wreck buoy, red and black H. S., third-class nun; Charlotte Harbor, entrance to, red buoy No. 0, second class nun; Mullet Key Shoal, black No. 0, third class can; Big Pass entrance to Clearwater Harbor, Florida, red No. 2, third-class nun.

The following-named buoys were discontinued, beacons having been erected in their places: Bar of Key Biscayne Bay, red No. 6, third-class nun; off Bache Shoal and south of Bowles Bank, black and white P. S., third-class can; Hen and Chickens, red No. 10, second-class nun; East Turtle Shoal, red and black H S., second-class can; East Washerwoman, red and black H. S., second-class can; Delaware Heads, black, second-class can.

The buoys in the district are all in place. Some 26 buoys were lost and not recovered. The long-continued absence of a buoy tender, which left the buoys in this district so long without attention, explains the loss of buoys. Some 26 of the spare buoys need extensive repairs, which can be made by the depot force.

DEPOTS.

Key West buoy depot and coal shed, Gulf of Mexico, Florida.—The complete repairs to the buoy depot and the coal shed were completed, and the buoy and coal sheds and wharves are now in good condition. The work consisted in taking down the two old sheds, taking up the flooring, driving some new piles under the foundations, covering all the piles with cast iron and terra-cotta sleeves and filling them with cement mortar, rebuilding the sheds, covering them with complete new roofs, soldering together and hanging new gutters and connecting them by gutter pipe with the four cisterns, erecting a partition between the coal and buoy sheds, painting all the new work, including the cisterns and gutters, making pipe connections between the cisterns, and running a pipe from one of the cisterns to the outer edge of the wharf and fitting it with a valve, etc., for supplying tenders with fresh water. The coal and buoy wharves were thoroughly overhauled, the floors being taken up, new piles driven, the piles covered with cast-iron pipe and terra-cotta pipe, filled with cement mortar, and new decking put on where required, the old material in decking, where sound, being used. Fender piles were driven outside the wharf; cast-iron sleeves were put over them and filled with cement mortar; they were bolted to the wharf. A fender cap was put on the piles and bolted down, and a fender strip was fastened to the outside of the fender piles, and mooring cleats were bolted to fender cap. The coal run was taken down and rebuilt: a new track was installed, and four iron-side dump cars for loading or unloading coal were purchased and stored at the depot. The blacksmith shop, a building 20 by 50 feet in plan, was completely repaired, and necessary fitments pertaining thereto, including a 40-inch bellows, were installed. A small building formerly used by the inspector as an office had a few minor repairs made to it.

Egmont Key, entrance to Tampa Bay, Gulf of Mexico, Florida.—Materials for use in repairs to the wharf and buoy shed were delivered, and the work was commenced and much was done by hired labor in June, 1899.

Tortugas Harbor, Fort Jefferson, Gulf of Mexico, Florida.—The buoy shed and blacksmith shop are in good condition.

Pensacola, Florida.—The light-house depot is not now in use. The property of the Light-House Establishment is being removed to Key West by the tenders on their return from each visit to Pensacola. The blacksmith shop is not used. It was closed on March 4, 1899, and all its fittings were taken to Key West. Previous to removal 80 shackles, 65 pins, 200 keys, 6 scrapers, and 25 bushings were made, 70 shackles were repaired, and 71 buoys were scaled and painted. The depot force repaired that portion of the railroad track leading from the buoy platform of the blacksmith shop to the main track.

TENDERS.

Mangrove.—This steel twin-screw steamer was built in 1897, and is of 320 tons burden. She was turned over to the Navy Department for service as a gunboat during the war with Spain, during which she did excellent service, among other things capturing the largest and the most valuable prize taken by any war vessel, the Spanish steamer *Panama.* She was returned to the Light-House Service on August 18, 1898. She was moored in Man-of-War Harbor until October 19, 1898, when she was again put in commission with new officers and new crew. In November, 1898, she was sent to Mobile, where she was docked and received such repairs as were necessary, including cleaning and painting her bottom, repairing the plate of the port propeller, which was cut off by a shell in the fight at Caibarien; replacing two deadlights and frames, straightening out hull plates framing in port after cabin, replacing bronze draft marks with lead, calking decks, reputtying the saloon floor, providing deck planks for the forward deck, strengthening the anchor davits, repairing the forecastle rail, supplying ventilators to the engine room, lengthening the fire rooms, and painting the ceiling in the saloon. The upper deck was covered with canvas and painted. She left Mobile December 15, 1898, and since that time has been steadily engaged in the work of inspection and supply of light-stations and in buoy work. This includes transferring light-house stores from Pensacola to Key West. In December, 1898, the blades of the port propeller were broken off at the

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wharf at Egmont Key. A new propeller was received and will be put on at first opportunity. In March, 1899, the *Mangrove* went to Havana, where she relieved all the channel and harbor buoys, took up and relieved two mooring buoys, and took up two permanent moorings, which were discontinued. She also laid a buoy to mark the bow of the wreck of the U. S. S. *Maine*. In April, 1899, she delivered 1,000 gallons of fresh water to Sand Key light. Her crew cleaned and painted 39 buoys, changed 36 buoys, and worked 39 days at light-house depots. The *Mangrove* in the performance of this duty steamed some 6,667 nautical miles, and consumed about 575 tons of bituminous coal. The vapor launch of the tender steamed about 500 miles and consumed some 235 gallons of kerosene oil.

Laurel.—This wooden twin-screw steamer of 320 tons burden was built in 1876. She returned to this district on August 12, 1898. There being no tender in the district previous to this date, such buoy work as was done was by borrowed tugs and vessels from the naval force at Key West. The *Laurel* was put in commission for service by the old crew of the *Mangrove*, who the day previous were discharged from the Navy, having served through the war with Spain in the *Mangrove*. She was employed at station duty until October 11, 1898, engaged in laying and working the electric cable for the International Ocean Cable Company. Since then the *Laurel* was engaged in buoy work and inspection, and has twice taken the officials of the naval station and Navy Department to and from Tortugas. During this period the *Laurel* has steamed some 6,944 nautical miles and consumed about 436 tons of bituminous coal. She relieved 295 buoys, cleaned and painted 297 buoys, established 2 new buoys, and worked 51 days at the depots.

Arbutus.—This wooden twin-screw steamer was built in 1879, and is of 400 tons burden. She was engaged during a part of the year in delivering materials and assisting in repairs to light stations; also in delivering supplies for the light-house inspector. The number of miles steamed and tons of coal consumed are reported under the head of the Eighth district.

Clover.—This wooden schooner was built in 1889 and is of 268 tons burden. She was engaged during a part of the year in delivering materials and assisting in repairs to light-stations, being used principally in connection with repairs at outlying stations as quarters for workmen, the working party going to and from the tender to the light-stations daily. The stations thus repaired by the tender were Sombrero Key, Key West, American Shoal, Alligator Reef, Carysfort Reef, Sand Key, Fowey Rocks, Northwest Passage, Tortugas Harbor, and Rebecca Shoals. With the exception of the month of August, 1898, when the tender was laid up, this vessel was engaged in making repairs to stations in the Seventh district. She is therefore not mentioned in the annual report for the Eighth light-house district. The tender sailed 3,460 miles during the year.

Tender for the engineer of the Seventh light-house district.—The following recommendation made in the Board's last annual report is renewed:

> The construction and repair service of the Seventh and Eighth districts is now done by one wooden steam vessel and a schooner. The coast line of these two districts is about 1,400 miles long, equal to the Atlantic coast line from Eastport, Me., to Cape Canaveral, Florida. The sailing tender is unsuitable for this service There should be another efficient steam tender for use in the Seventh district. It is estimated that one can be built and fitted out for $85,000, and it is recommended that an appropriation of this amount be made therefor.

EIGHTH DISTRICT.

This district extends from but does not include Perdido Entra Florida, to the southern boundary of Texas. It embraces all aid navigation on the Gulf coast of the United States and tidal wa tributary to the Gulf between the limits named, together with t on the Mississippi River below New Orleans and on Grand Lake Lake Chicot.

Inspector.—Lieut. Commander A. V. Wadhams, United States N

Engineer.—Lieut. Col. A. N. Damrell, Corps of Engineers, Un States Army.

In this district there are—

Light-houses and beacon lights, including 27 post lights on the Mississippi River, Grand Lake, and Lake Chicot	[illegible]
Light-vessels in position	[illegible]
Day or unlighted beacons	[illegible]
Fog-signal operated by steam	[illegible]
Fog-signals operated by clockwork	[illegible]
Gas-lighted buoys in position	[illegible]
Whistling buoys in position	[illegible]
Bell buoys in position	[illegible]
Other buoys in position	12
Steamer *Pansy*, buoy tender, and for supply and inspection	1
Steamer *Arbutus*, for construction and repair in the Seventh and Eighth districts.	1
Sailing tender *Clover*, for construction and repair in the Seventh and Eighth districts	1

LIGHT-STATIONS.

931. Sand Island, off Mobile Point, Gulf of Mexico, Alabama.—As the action of the sea is fast washing away the island on the southeast and southwest, it was decided to place rock riprap around the tower. Contract was made for furnishing and delivering 5,000 tons of rock ranging in weights from 10 pounds each to 5 tons each. The work done during the year consisted in extending the wharf out 150 feet and building a T-head on the end 60 feet by 30 feet, and laying a track 1,300 feet long across the island, with a switch leading around the east side of the tower 220 feet long. A derrick, boiler, and hoisting engine were put on the T-head, cars for hauling the rock across the island were put together, and a body was made and placed on each of them. The brick house in front of the tower, formerly used as an oil house and storeroom, was taken down, and the doorway leading from this room into the tower was closed. A working party was hired to place the rock contracted for in position around the base of the tower. Up to June 30, 1899, there had been delivered 2,599 tons of rock and 2,79 barrels of oyster shells, and of these there had been put in place 1,90 tons of rock and one-third of the shells. The rock, weighing from 1 pounds to 300 pounds, was placed; then the oyster shells were used t fill the crevices; then the large rock was placed on top of all, thus form ing a complete breakwater around the tower and preventing the sweep ing away of the sand at its base.

The following is an extract from the Board's last three annual reports

> For several years past the destruction of this station has been threatened by th encroachment of the sea. The island has been cut away to such an extent that th

> tower and buildings, which are of masonry, are now entirely surrounded by water. The light is of great importance, since it forms one of the system of coast lights and marks the entrance to Mobile Bay. It is proposed to erect new structures so designed that if necessary they can be taken down and removed to another safe site should the cutting away of the island continue.
>
> It is estimated that this can be done for $65,000, and it is recommended that an appropriation for this amount be made therefor.

The Board renews the recommendation.

935. *Middle Ground beacon, on a line with the established Mobile ship channel lights, near the westerly end of Middle Ground Shoal Spit, Alabama.*—The metal work was delivered and the beacon was erected by the tender *Arbutus*. It is a red, square, four-pile structure, with a platform supporting a column from which a lantern is suspended, and a lantern house with "Middle Ground" in white on the north, south, and west sides. The beacon stands in about 24 feet of water near the western end of the Middle Ground Shoal Spit and ranges with the established Mobile ship channel lights. It can be passed in 22½ feet of water about 20 yards to the starboard. It bears a fixed white five-day lens-lantern light, the focal plane of which is 34 feet above mean high water. This beacon was recently run into by some unknown vessel, when one of the columns was broken and the others cracked. The beacon was taken down and the light was shown in the interim from a fender pile. The metal work was repaired, needed new parts were furnished, the beacon was rebuilt in its former site, and the light was reestablished in its former position. Three clusters of fender piles, consisting of three piles to each cluster, were put on three corners of the beacon.

952. *Mobile Ship Channel Light No. 7, on the southwesterly side of the dredged channel, about seven-sixteenths of a mile westerly from Battery Gladden light-house, Alabama.*—About March 2, 1899, this iron beacon was run into by the British steamer *Homer* and badly damaged. It was taken down, repairs were made to the metal work, and the beacon was rebuilt in its original position. The light, which was shown from a fender pile alongside the site of the beacon during the repairs, was reestablished. There was no change in the characteristic or position of the light.

935 to 953, except 940 and 950. Mobile ship channel lights, Alabama.—The present method of lighting this channel with beacons bearing oil lens-lanterns has not proved satisfactory. The swinging of the lanterns, which are now suspended from a column on the beacons, impairs the effectiveness of the lights, so it is proposed to erect stands on the platforms of the beacons, to which the lanterns will be bolted when hoisted in place, thus rendering the lights stationary.

954. *Horn Island Pass beacon, Mississippi.*—The materials were delivered for use in the erection of a beacon, but work has not yet been started.

955. *Horn Island, on the east end of Horn Island, Mississippi.*—A set of chariot wheels was installed as repairs to the illuminating apparatus. A new cypress cistern was furnished.

957. *Round Island Spit beacon, about one-half mile north of Round Island, Mississippi.*—A brown, triangular, pyramidal, wooden beacon, having an upper part of latticework, with supporting piles protected by iron pipe, was built in 7 feet of water on the starboard side of the channel north of Round Island, Mississippi, going westward, and about 100 feet from the channel. It will show a red light with a focal plane 30 feet above mean high water.

Eighth District.

—. *Pearl River, on the east bank of the river, about seven-eighths of a mile below the railroad bridge, Mississippi Sound, Mississippi.*—The following recommendation, made in the Board's last five annual reports, is renewed:

> An appropriation of $250 was made by the act approved on March 2, 1889, for the establishment of a light at this point. Continuous but unsuccessful effort has been made to obtain title to a site on which a proper structure could be erected. The difficulty is that the owner can not give such a title as the Government can accept. The legal costs of condemning a site would probably exceed the appropriation. The Board therefore recommends that Pearl River be included in the general appropriation for lighting rivers, when under its provisions a site for the light can be leased and the light can then at once be established.

962, 963. Ship Island South Channel range beacon lights, westerly end of Ship Island, Mississippi.—Two brown, 4-pile, wooden, pyramidal structures, covered with horizontal slats and supporting an arm from which a lantern is suspended, were built on the westerly end of Ship Island, to form a range for running the South Channel into Ship Island anchorage. The front light is a red lens-lantern light 28½ feet above mean high water, and is located on the southerly beach of westerly end of Ship Island, about 850 feet SSW. from Ship Island light-house. The rear light is a fixed white lantern light 40½ feet above mean high water, and is located on the northerly beach on the westerly end of Ship Island, about 646 feet N. ¾ W. in the rear of the front light.

965. Cat Island, western end of Cat Island, Mississippi.—The iron foundation work was scaled, scraped, and painted three coats. A boat davit was put up on the gallery, and brace was put under the gallery, with stanchions to keep the boat from swinging under the gallery when it is being hoisted. The bell was swung from a new frame. A weight box was installed to receive the weights when the machine is running and to give them a longer drop, thus increasing the running time of the machinery. A complete set of striking machinery was installed. Various repairs were made.

973. Port Pontchartrain, Lake Pontchartrain, Louisiana.—The revolving machinery of the illuminating apparatus was thoroughly repaired. The light was shown as a fixed instead of a revolving light for one month.

982. South Pass East Jetty, mouth of the pass, near the end of the eastern jetty, Louisiana.—Materials were purchased and delivered by a hired vessel. The station was thoroughly repaired. A frame was made for the fog bell, a house was provided for the protection of the striking machinery, and a sounding board was placed behind the bell, so as to throw the sound toward the river and to the seaward. A plank walk resting on 3-inch galvanized gas-pipe piles and 7-inch flanges was built between the dwelling and the new boathouse. There are 245 feet of walk 8 feet wide and 95 feet of walk 5 feet wide. The entire walk was fitted with a hand rail. At the end of the walk steps were built leading to the top of the jetty crib, and on the opposite side steps were built leading from the jetty crib to the water. All the plank was repaired. A boathouse was built on the site of the old one. It rests on piles, is 16 feet by 22 feet in plan, and is fitted with boat davits. The exterior received two coats of paint. Various repairs were made.

983. South Pass West Jetty, at the mouth of the pass, on the end of the western jetty, Louisiana.—Materials for repair were delivered by the hired vessel *Alpha* and all needed repairs made. The beacon was removed from the old foundation, new 12-inch piles 35 feet long driven, and the beacon was replaced on a new foundation. The old roof floor was replaced with new tongued and grooved flooring. A new hand rail was placed around the beacon. The roof floor was painted two coats. Repairs were made to 1,750 feet of plank walk and hand rail. A walk 5 feet wide by 65 feet long was built between the main walk and the wing dam. Minor repairs were made to the beacon.

985. South Pass (rear), on the west side of South Pass, Louisiana.—All of the plank walks were repaired and about 500 feet of new walk built. Some 305 running feet of revetment in front of the station was rebuilt and a plank walk 4 feet wide was built on its top for its entire length. Various repairs were made.

986. Southwest Pass, on a low marshy island on the west side of the pass, Louisiana.—The metal work for repairs for rebuilding dwellings and for the cylinder of the tower was purchased and delivered by contract and the station was put in thorough repair. The work consisted in rebuilding the tower cylinder from the lantern down, building the keepers' dwelling complete, and putting new iron stairs into cylinder leading up to the lantern room. A new cistern with 10-foot bottom and 9-foot staves was erected on a new foundation, and connections were made with the keepers' kitchens and with the gutters of the dwelling. Two squares of 2-inch platform were built under the tower. The temporary dwelling was raised 20 inches and the brick pillars increased that much in height. A 3-foot plank walk was built around the temporary dwelling and the plank walk leading from the tower to the bayou was repaired.

987. Head of Passes, on Deer Island, at junction of Southwest and South passes, Louisiana.—The wharf was extended out 100 feet to deep water and a boathouse was built on the outer end, fitted with davits for hoisting two boats at once. The walk leading from the dwelling to the wharf, 530 feet long by 8 feet wide, was rebuilt, and a walk 5 feet wide and about 1,000 feet long was built from the wharf to the west jetty beacon. A foundation was built and a new cistern with 10-foot bottom and 9-foot staves was erected on it, in the rear of the assistant keeper's kitchen, and with proper connections. The fencing was repaired and 956 feet of new fence built. The oil house was repaired and the plank walk leading to it was repaired. A new fog-bell tower was built inside of and behind the west jetty, about 100 feet south of the west jetty beacon and about 1,200 feet NNE. from the old fog-bell tower, the site of which had proved to be unsatisfactory. It is a square, pyramidal, structure standing on piles, the lower section open and the upper section inclosed. Its top is 30 feet above mean high water. The foundation is painted black and the tower white. The fog bell was removed from the old tower and a new striking machine was installed. No change was made in the characteristic of the fog bell. A plank walk 980 feet long by 5 feet wide was built from the keeper's dwelling to the tower. The old tower was fitted with two windows and a door and changed into an addition to the keeper's dwelling. Minor repairs were made.

989. Head of Passes East Jetty, upper entrance to South Pass, Louisiana.—A square black pyramidal wooden beacon, upper part of slats, was built, resting on four piles, adjoining the former light, which was shown from a post, and the light was transferred to the new structure. No change was made in the height of the focal plane nor in the location or characteristic of the light.

Eighth District.

990. Cubits Gap light and fog-signal, Mississippi River, below New Orleans, Louisiana.—The following recommendation, made in the Board's last two annual reports, is renewed:

> The keeper is now living in a rented building, which is barely habitable, and is the only one available. A keeper's dwelling seems to be urgently needed. It is estimated that a suitable structure can be erected for not exceeding $2,500, and it is recommended that an appropriation of this amount be made therefor.

1009. Timbalier, entrance to Timbalier Bay, Louisiana.—Materials were delivered for use in repairs. The work will soon be commenced.

—. *Oyster Bayou, Gulf of Mexico, Louisiana.*—The following recommendation, made in the Board's annual reports for 1894, 1897, and 1898, is renewed:

> This bayou opens into the Gulf of Mexico, and is the entrance inland for all small craft engaged in the oyster, fish, and other industries. The vessels, something over 300 in number, supplying the four oyster packers at Morgan City, pass through Oyster Bayou. Vessels frequently attempt to make the bayou at night, and, lacking a light to indicate the entrance, sometimes sail 5 or 6 miles beyond it before discovering their mistake. It is therefore proposed that a light-house be placed here. Oyster Bayou is a recognized inside channel. If vessels did not pass through it, they would have to go around Pointe au Fer and the Southwest Reef light-house to reach Morgan City, thus taking an outside route very dangerous for small vessels. The mouth of the bayou is exposed to the severe storms of the Gulf, which, at times, bank the water up to a height of 6 or 7 feet above the ordinary level and sweep over the place in violent waves. Hence it will be necessary to place the light-house on iron piles in order to raise it above the reach of storm waves. The station should be established on the point formerly occupied by the private light maintained there by certain oyster packers of Morgan City. It should consist of a keeper's dwelling, from the top of which should be shown a white light from a lens-lantern. It is estimated that this could be built at a cost not to exceed $5,000. Recommendation is made that an appropriation of this amount be made therefor.

1011. Southwest Reef, entrance to Atchafalaya Bay, Louisiana.—Materials were delivered for use in repairs. The work will soon be done.

1021. Mermenteau River, near the mouth of the Mermenteau River, Gulf of Mexico, Louisiana.—The act of July 1, 1898, provided $7,000 for the erection of a light at the mouth of Mermenteau River, Louisiana. Examination was made of the locality to find the best site for the light. Soundings were made and it was found that there was no regularly established channel at the entrance, and that the best water, in places, was not more than 3 feet; also that the bar shifted with each change of wind. The most desirable site was found on the left side of the mouth of the river going in, and about 100 yards back from the bank. The land is low, and at high tide with a south wind is submerged. The land belongs to private parties, but a sufficient quantity for the light-station can be purchased at a small cost.

1022. Calcasieu, in marsh at entrance to Calcasieu River, on west bank of Calcasieu Pass, Louisiana.—Materials were delivered for use in repairs to this station.

1023. Sabine Pass Jetty Beacon, on the easterly jetty at the entrance to Sabine Pass, Louisiana.—Materials for use in repairs to this beacon and for a landing were delivered.

—. *Sabine Pass jetty light and fog-signal station, Louisiana and Texas.*—The protecting mat of the east jetty extends out about 4 miles, and the nearest light to its entrance is a small beacon light about 1½ miles inside the end, too far inside to serve as a guide to the entrance of the jetty. Sabine Pass as a port of entry has grown rapidly. The receipts and shipments for 1896 and 1897 show an increase from $199,042 in 1896 to $475,288 in 1897. It appears from the records that 99 vessels entered and cleared during 1897, that there were 403 trips made, and

Eighth District.

that 104,333 was the net registered tonnage. The largest vessel which passed out drew 23.6 feet. The Board therefore deems that the needs of this port require the establishment here of a light and fog-signal. It is estimated that a suitable structure here, similar to the one at Brazos Santiago, Texas, can be built for $40,000. It is therefore recommended that an appropriation of this amount be made therefor.

The House of Representatives Committee on Appropriations called for suggestions from the Treasury Department as to the propriety of passing H. R. bill No. 11357, appropriating $40,000 for the establishment of a light-house at Sabine Pass, and was informed by letter of February 9, 1899, that the Treasury Department recommended the passage of the bill in question.

1024. Sabine Pass, on Brandt Point, east side of the entrance to Sabine Pass, Louisiana.—Materials were delivered for use in necessary repairs. New chariot wheels and an oil feeder were furnished.

—. *Sabine Bank light and fog-signal station, Texas.*—By act approved March 3, 1899, a light and fog-signal on Sabine Bank, Texas, were authorized, to cost not exceeding $50,000, but no appropriation was made for the construction of the station. The following recommendation, made in the Board's last annual report, is therefore renewed:

> The Government works of improvement at Sabine Pass have resulted in increased depth of water and a larger commerce to and from this port. A light and fog-signal are needed here to guide vessels clear of the shoals. A survey has recently been made and borings taken at the site of the proposed light to determine the character of the foundation. It is estimated that a light and fog-signal station can be established here for not exceeding $80,000, and it is recommended that an appropriation of that amount be made therefor.

1025. Galveston jetty, Texas, on the outside of the north jetty where it turns toward the north.—No work was done under the special appropriation for this station. It has been decided to build a station similar to the one at Rebecca Shoal, Florida, with a platform resting on two piles and supporting a house and fog siren, located at the end of the jetty on the north side, sufficiently away to clear the rocks. The plans and specifications for the light are being prepared.

1026. Galveston North Jetty, entrance to Galveston Harbor, Texas.—The hoisting rope on this beacon light broke and the lantern was smashed. A new lantern and hoisting rope were installed. Materials for repairs to the structure and for the erection of a boathouse and landing platform have been delivered.

1031. Bolivar Point, on Bolivar Point, north side of entrance to Galveston Bay, Texas.—Materials for repairs were delivered.

1032. Fort Point, on the northeast end of Galveston Island, Texas.—Materials were delivered for repairs.

1034. Halfmoon Shoal, in the bay between Pelican Island and Dollar Point, Texas.—Materials were delivered for repairs.

1035. Red Fish Bar, on Red Fish Bar, off Edwards Point, Texas.—Under the appropriation of $8,000 for a new light, provided by the act approved July 1, 1898, an examination was made and samples were obtained of the bottom, depth of water, etc., at the site of the proposed light. Contract was made for altering, repairing, and furnishing metal work for the foundation and lantern of the new structure, and the materials for construction have all been ordered, and they, with the metal work, are awaiting transportation to the site of the work, when the station will be built.

1036. Brazos River jetty light-station, entrance to Brazos River, Texas.—Two sections of 24-inch inside diameter cast-iron water pipe were installed to receive the bell weights and lengthen the time the striking machinery will run without rewinding. The hoisting rope broke after the lantern was hoisted in place and the lantern fell and was badly broken. It was replaced by a small lantern at the same height as the former light, with no cessation in the display of the light. A new lantern and steel hoisting rope were installed.

1037. Brazos River, about 1 mile inside its mouth, Texas.—Materials were delivered for use in repairs.

1038. Matagorda, Matagorda Island, entrance to Matagorda Bay, Pass Cavallo, Texas.—The repairs to this station, which were commenced in 1898, were completed in July, 1898. A wharf 310 feet long by 8 feet wide, and with a T-head 20 feet long, all resting on 3-inch galvanized gas-pipe piles, was built, and a boathouse 14 feet by 30 feet was placed near the T-head. Iron stanchions were put up around the lantern and covered with galvanized, 2-inch mesh, iron wire to protect it from flying birds. A door was fitted to the watch room. A galvanized-iron corrugated roof was put on the oil house and painted.

—. *Reimbursement of light-keepers for losses sustained during the hurricane of October 1, 1893.*—The following recommendation, which was made in the Board's last five annual reports, is renewed:

Statements of these losses, to the amount of $2,603.62, approved and recommended by the inspector of the Eighth light-house district, were sent by the Secretary of the Treasury to the Speaker of the House of Representatives in his letters of March 7 and April 3, 1894, with recommendation that reimbursement be made. The Board recommends that an appropriation of this amount be made therefor.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

950. Battery Gladden, Ala.
960. East Pascagoula River, Miss.
984. South Pass Beacon, La.
988. Head of Passes West Jetty, La.

LIGHT VESSELS.

981. South Pass light-vessel, No. 43, moored in 82 feet of water off the South Pass entrance to Mississippi River, Louisiana.—This composite light-vessel was built in 1880–81, is of about 190 tons burden, shows a fixed white light, and has a 12-inch steam whistle for a fog-signal. No repairs made. On October 29, 1898, the vessel was replaced on her station for the winter months. A set of lamps were installed. Heretofore this vessel was withdrawn from her station during June, July, August, and September. It was decided to retain her on her station until August and to withdraw her only during August, September, and the first half of October of each year, as the atmospheric conditions are such at the mouth of the river that it is difficult to make out the entrance to the jetties from seaward. The light vessel is more readily seen, and serves as a point of departure for the entrance to the river. Many repairs are needed, and will be made while she is off her station.

1030. Galveston light-vessel No. 28, inside of Galveston Bar, Gulf of Mexico, Texas.—This wooden light-vessel was built in 1888, is of 101 tons burden, shows a fixed red light, and has a bell for a fog-signal. During May, 1898, the vessel was withdrawn from her station, owing to the planting of submarine mines in the entrance to Galveston, and she was replaced on September 20, 1898. While off her station she was docked, her bottom was stripped, and she was calked and remetaled.

Some planking was replaced. Repairs were made to her sternpost and a new rudder was made and fitted. The quarter-deck roof was extended some 7 feet forward and about 6 feet aft and covered with cotton canvas. This extension was made for the purpose of catching rainwater.

DAY OR UNLIGHTED BEACONS.

Sand Island day beacon, Alabama.—To prevent this day beacon from being carried away by the sea it was removed about 100 feet farther north, on the same range. The work was done by the tender *Arbutus.*

Mobile ship channel day beacons, Alabama.—Day beacons, consisting of three piles bound together at the top and surmounted by a latticework, forming a basket, above which rises a post with cross arm, were built on the easterly side of the dredged channel, intervening between the lighted beacons as follows:

Beacon A between Middle Ground light and light No. 2.
Beacon B between lights Nos. 2 and 4.
Beacon C between lights Nos. 4 and 6.
Beacon D between lights Nos. 6 and 8.
Beacon E between light No. 8 and Mobile Bay light.
Beacon F between Mobile Bay light and light No. 10.
Beacon G between lights Nos. 10 and 12.
Beacon H between lights Nos. 12 and 14.
Beacon I between lights Nos. 14 and 16.

All of the beacons are painted mineral brown and have a board fastened near the tops of the piles on the side facing the channel, with their distinguishing letters painted in white on it. Each beacon is 17½ feet above mean high water.

East Pascagoula River day beacons, Mississippi.—Four wooden day marks were erected on the port side of the entrance to East Pascagoula River, Mississippi. The first one is located 4,000 feet southeast of East Pascagoula River Range beacon (front), and the other three at intervals of 3,000 feet. The beacons stand on the edge of the channel. They are 3-pile wooden beacons, painted black. The piles are bound together at the top by a chain and surmounted by a 6-inch center post with 3-inch strips nailed across in shape of a ball. It is 15 feet from mean high water to the top of the ball.

St. Joseph Island beacon, Mississippi.—A square, pyramidal, wooden day beacon, its upper part slats, supporting the laticework ball, was built in 7 feet of water about 78 feet SW. by W. ¾ W. from the center post of the old St. Joseph Island light. The beacon is painted mineral brown, and is thus located: Merrill Shell Bank light bears NE. by E. ¾ E. 9⅜ miles; Henderson Point bears N.E. ⅝ N. 10⅛ miles; North Point of Grand Island bears S. ⅜ E. 1½ miles.

Range beacon, Pass a Loutre, Louisiana.—This beacon has been carried away. The other day beacons in this district are in good order.

FOG-SIGNAL OPERATED BY STEAM OR HOT AIR.

981. *South Pass light-vessel No. 43, Louisiana.*—This 12-inch steam whistle was in operation about 499 hours and consumed some 23 long tons of anthracite coal.

BUOYAGE.

The following-named buoy appendages were received during the year: 105 fathoms 1¼-inch chain, 105 fathoms 1-inch chain, 90 fathoms

1½-inch chain, 120 fathoms 1⅛-inch chain, 10 second-class swivels. 48 second-class shackles, 48 third-class shackles. Four gas buoys were maintained in the entrance to Galveston Bay during the year.

DEPOTS.

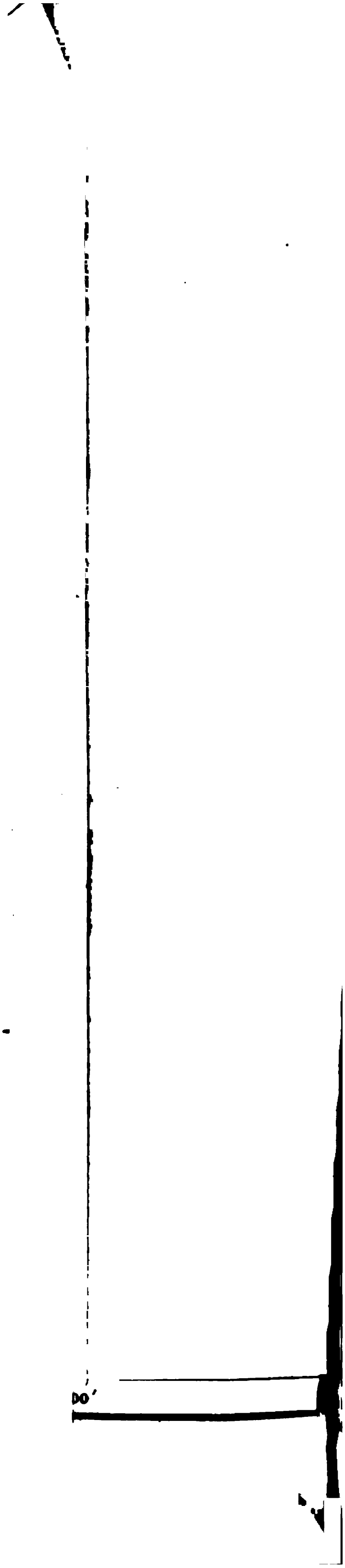
Port Eads, Louisiana.—The buoy shed was put in thorough repair. The work consisted of taking off the old roof and replacing it with cypress shingles, repairing the eave gutters, and removing the old decking and stringers where decayed and putting in new materials at the following points: The four large cisterns were raised, moved to the centers of their foundations, and fastened down. They were supplied with new tops, and each received two coats of paint. The globe valves and pipes, which had been damaged by the freeze, were replaced.

Mobile, Alabama.—By act approved March 3, 1899, an appropriation of $12,000 was made for building a wharf, buoy shed, and coal depot at or near Mobile, Ala., with a view to using the light-house reservation at Choctaw Point, Alabama, or a suitable location in the vicinity. Plans and specifications for the work are in hand.

TENDERS.

Pansy.—This iron, twin-screw steamer, which was built in 1878, is of 157 net tons burden. She cared for the buoys, delivered fuel, provisions, and supplies to the light-houses, and conveyed the inspector on his quarterly visits of inspection to the lights. She delivered annual supplies to light-stations in Lakes Borgne and Pontchartrain. She also painted all the post lights below New Orleans and erected a new one at Poydras Hall. She established 14 and discontinued 7 buoys during the year. She spent several days at depot, while her crew cleaned and painted the spare buoys and buoy appendages. Her 25-foot naphtha launch aided greatly in landing stores, especially where the tender was compelled by shoal water to anchor long distances from light-stations. Two water filters with a Cameron steam pump were installed for filtering the Mississippi River water for the ship's use. The tender steamed about 7,512 miles and consumed some 605 long tons of coal.

Arbutus.—This twin-screw wooden steamer was built in 1878, is of 75 net tons burden. She was used in delivering materials and assisting in repairs to light-stations, also in repairing the electric cable between Ship Island and Biloxi, Miss., and from Sand Island to Fort Morgan, Ala. This tender delivered materials at Sand Island, erected Middle Ground beacon, which was taken down and rebuilt; took down and rebuilt beacon No. 7, Mobile Bay; moved Sand Island beacon to a new site, and delivered material at Merrill Shell Bank, Head of Passes, Fort Point, Half Moon Shoal, Bolivar Point, Sabine Pass, Southwest Reef, Calcasieu, Timbalier, Southwest Pass, and Brazos River light-stations. She also delivered materials and constructed range beacons at Ship Island, Mississippi. A new foremast and boom were put in and a new lightning rod was installed. She was furnished with an auxiliary boiler for running the electric lights when no steam is on the main boilers. A chart room was built, about 11 feet by 12 feet, having 2 doors and 6 windows. It has a pine frame covered outside with cypress and is ceiled inside with the same material. It is located on the hurricane deck, just abaft the aftermast. The tender steamed some 16,495 miles and consumed about 791 tons of coal during the year.


DO'

NINTH DISTRICT.

his district includes all aids to navigation on Lake Michigan, Green , and tributary waters lying west of a line drawn across the Straits ackinac just east of Old Mackinac Point light-station, Michigan.

spector.—Commander C. O. Allibone, United States Navy.

ngineer.—Lieut. Col. Milton B. Adams, Corps of Engineers, United tes Army, to October 6, 1898; since then Capt. James G. Warren, ps of Engineers, United States Army.

here are in this district—

t-houses and beacon lights	112
t-vessels in position	4
signals operated by steam	31
signals operated by clockwork	7
ys in position	102
lighted buoys	9
mer *Dahlia*, buoy tender, and for supply and inspection	1
mer *Amaranth*, engineer's tender, for repairs and construction	1
m launch *Lotus*, for construction and repair	1

TE.—The number preceding the name of a light-station in the Ninth, Tenth, enth districts, and that portion of the Third district on Whitehall Narrows, and United States waters of Lakes Champlain and Memphremagog is that by which designated in the List of Lights and Fog-Signals of the United States on the thern Lakes and Rivers, corrected to the opening of navigation, 1899.

LIGHT-STATIONS.

84. *Old Mackinac Point, Straits of Mackinac, Michigan.*—Tubes were ced in one of the fog-signal boilers. A sketch was made showing additional land required for light-house purposes at this station. oceedings in condemnation were begun. A hearing of the case is to held in July at Bay City, Mich. Various repairs were made.

85. *McGulpin Point, Straits of Mackinac, Michigan.*—A barbed-wire nce was built, inclosing the reservation. A storm house was built at e front entrance to the keeper's dwelling. Various repairs were de.

391. *Waugoshance, Lake Michigan, Michigan.*—New boilers were pro-ded under contract to take the place of the old-style boilers now in e. They will be installed as soon as practicable.

395. *Little Traverse, Lake Michigan, Michigan.*—A lightning rod was rchased and delivered at the St. Joseph depot.

—. *Petoskey breakwater, Lake Michigan, Michigan.*—A metal post was ected on the outer end of the westerly breakwater and located 14 feet om the outer end of the pier, and a small lamp house was put up in e rear of the post. Two lantern lights, red above white, were estab-shed upon the post and will be shown for the first time on the night f July 1, 1899.

398. *Grand Traverse, Lake Michigan, Michigan.*—An appropriation of 5,500 was made by the act approved July 1, 1898, to provide a steam g-signal. Plans, specifications, and estimate for establishing the g-signal were prepared and the structures were contracted for on January 20, 1899. The work of construction will be undertaken as soon as material can be obtained and delivered at the station, and it is likely that the signal will be in operation in the early fall.

Ninth District.

400. North Manitou, Lake Michigan, Michigan.—A fourth-order lantern was provided under contract. The following-named work was done toward erecting a wooden light tower in July: The knoll at the site for the tower was leveled, and four brick piers were built with footings, and the posts, sills, caps, and braces were framed. The erection of the wooden tower was completed in August and the lantern put up. The light, an alternating red and white flash every ten seconds, was established on September 15, 1898. The old landing crib was rebuilt and enlarged. Another crib was built with an ice breaker on the outside, and the boat ways were extended some 55 feet. A one-plank walk, 644 feet long, was laid from the boathouse to the dwelling and a lightning rod was put up. A flag pole 60 feet long was provided. The skeleton frame tower was covered with clapboarding, and various repairs were made.

A judgment was rendered January 23, 1899, in the United States district court for the condemnation of a site on North Manitou Island for the light and fog-signal station, and $487.41 was deposited with the clerk of the court on February 25, 1899, in payment therefor. Due record of the fact was made in the office of the register of deeds of Leland County, Mich., and a description and plat of the land sent to the governor.

403, 404. Frankfort pierhead range, Lake Michigan, Michigan.—The elevated walk was renewed for some 280 feet. The old fog bell striking apparatus, formerly at Chicago, was thoroughly repaired and shipped to Frankfort for use there. Various repairs were made.

405, 406. Portage Lake pierhead range, Lake Michigan, Michigan.—The following recommendation, made in the Board's last three annual reports, is renewed:

> This station consists of two lights on the Government pier, but there is no dwelling here for the keeper. It is estimated that an appropriate structure can be erected for $3,500, and it is recommended that an appropriation of this amount be made therefor.

407. Manistee pierhead, Lake Michigan, Michigan.—The fog-signal house, which was damaged by the schooner *Smith and Post*, of Ashtabula, Ohio, was repaired. Various repairs were made.

409. Grande Pointe au Sable, Lake Michigan, Michigan.—The timber platform around the tower and dwelling was rebuilt. Some 362 running feet of plank walk were rebuilt. A plan and estimate of cost for encasing the tower with metal were prepared. The work will be undertaken as early as practicable. Various repairs were made.

411, 412. Ludington pierhead range, Lake Michigan, Michigan.—The beacon was moved close to the signal house and a covered way built between them. The whistle was moved from the fog-signal building and placed in front of a sound deflector on the front wall of the beacon. The sound deflector was again moved from the front of the beacon and placed on the roof of the signal house at a height sufficient to clear the dome of the lantern, as the former location interfered with the operation of the whistle. The oil house was moved some 400 feet west on to the new portion of the pier. The gas machine was discontinued and shipped to St. Joseph light-house depot. An appropriation was made by the act approved on July 1, 1898, for the construction of a keeper's dwelling. Plans and estimate of cost of keeper's double dwelling were prepared and contracts were made for building a double dwelling.

413, 414. Pentwater pierhead range, Lake Michigan, Michigan.—Four posts for the beacon were spliced, three sills renewed, and the beacon was moved to the inner end of the outer crib of the pier to place it upon a sound foundation.

417. White River, Lake Michigan, Michigan.—Some 200 feet of sand fence was erected on the west side of the station grounds. Various repairs were made.

418, 419. Muskegon pierhead range, Lake Michigan, Michigan.—Plans and specifications for fog-signal boilers and machinery and plans and estimate of cost for the reconstruction of the rear range light and the building of 750 running feet of elevated walk were made. The material for the fog-signal house was ordered and much of it was delivered. The boilers and machinery under contract were inspected and found satisfactory. Two 10-inch steam fog-signal whistles were provided. The fog-signal building and the upper course of superstructure were framed ready for shipping to the station. The signal is to be in operation by the end of the summer.

424, 425. Holland pierhead range, Lake Michigan, Michigan.—Material was purchased and delivered for repairs to the dwelling. An addition was made to the dwelling containing three additional rooms and pantry. Various repairs were made.

427. Kalamazoo, Lake Michigan, Michigan.—Material was purchased and delivered and the dwelling was thoroughly repaired. The boathouse was also thoroughly repaired. A platform was rebuilt at the kitchen door and a walk was laid from the front veranda to the platform. A landing pier 59 feet long was built extending into the river some 47 feet from the shore line. Twelve piles were driven and 2-inch plank were placed on the cross-ties. A trestle walk about 174 feet long, with hand rail, was built to reach the landing pier.

429, 430. St. Joseph pierhead range, Lake Michigan, Michigan.—One of the sills of the beacon that was decayed was removed and a new one put in. A new spar to replace the broken one for a light to locate the wreck of the steamer *City of Duluth* was erected under the supervision of the inspector of the district and paid for by the engineer of the district.

431. St. Joseph, Lake Michigan, Michigan.—A hot-air furnace was set up in the keeper's dwelling. Some 132 running feet of wrought-iron fence, with gate, were purchased. Various repairs were made.

432. Michigan City, Lake Michigan, Indiana.—The dwelling, tower, outbuildings, and fence were painted.

The following recommendation, made in a previous annual report of the Board, is renewed:

> The Board is of opinion that a fog-signal at this station would be a valuable aid to navigation. It is estimated that it could be established for a sum not to exceed $5,500, and it is recommended that an appropriation of that amount be made therefor.

433. Calumet pierhead, Lake Michigan, Illinois.—The fog-signal boilers and machinery were built by contract and delivered. The tower was listed to one side by an ice shove on the night of February 14, 1899. The lens apparatus, which was three-eighths inch out of level, was temporarily leveled. The fog-signal building, 20 feet by 40 feet, was put up, fastened with strap anchors to the substructure, sheathed inside and outside, and the walls were filled in with sawdust and lime from the sill to the plate. The roof was shingled with Cortright metal roofing, the outside walls were covered with corrugated iron, the cornice with plain iron, and a concrete and brick floor was laid. The boilers and machinery were installed and the signal was ready for operation on July 1, 1899. The dwelling is in a deplorable condition, unfit for human

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habitation. It is estimated that a new dwelling can be built for $7,500, and recommendation is made that an appropriation of that amount be made therefor.

434. Chicago breakwater (south), Lake Michigan, Illinois.—The gas machine was repaired. A pump for the gas machine, shipped from St. Joseph, was put in and the machine tested.

436, 437. Chicago pierhead range, Lake Michigan, Illinois.—The bell apparatus, formerly in use at St. Joseph Pierhead, was repaired and placed in position at this station. The old fog bell apparatus was removed and shipped to the light-house depot at St. Joseph for repairs, preparatory to being used at Frankfort Pierhead.

438. Chicago Harbor, Lake Michigan, Illinois.—The iron ladder that was carried away by the gale on October 7 and 8 was replaced, and the boat davit that was broken off by a passing vessel was replaced.

441. Waukegan pierhead, Lake Michigan, Illinois.—A temporary iron post was established at the outer end of the north pier, and the light was exhibited on August 10, 1898, and a lamp and cleaning house was built. The light was changed in October from white to red. On December 31, 1898, the fifth order fixed white light on the bluff in the city of Waukegan, southerly side of Little Fort River, westerly side of Lake Michigan, was discontinued. City water was introduced into the keeper's dwelling. Contracts were made for the erection of a permanent metal tower for the north pier. The metal work for the tower was shipped to Waukegan on June 29, 1899, together with an improved fourth-order lantern, formerly stored at Detroit light-house depot. A concrete foundation for the tower, measuring 6 feet 6 inches by 16 feet by 15 feet was made at the end of the south pier, the work below water being concrete in bags. An oak fender, 24 feet long, was placed on the south side, and the piling was cut off flush to this, and the foundation of the tower was completed. The tower will soon be erected.

Waukegan Reservation.—A survey and plat of the light-house reservation was made, with a view to the sale of all of it except the water front. The sale at public auction was made on June 20, 1899, to the city of Waukegan.

442. Kenosha, Lake Michigan, Wisconsin.—Sidewalks were built in front of the premises 68 feet long. A flag pole 80 feet long was erected due south from the center of the tower. Various repairs were made.

443, 444. Kenosha pierhead range, Lake Michigan, Wisconsin.—The elevated walk was repaired for some 662 feet and 365 feet of plank walk was laid on the pier from the stairs to the watch room and 424 feet of 1-plank walk was laid from the end of the walk on the pier to the trestle walk in the rear of the light-house lot. A trestle walk 3 feet wide and 128 feet long, with hand rails, to the rear gate in the light-house lot was built. Various repairs were made.

445. Racine Reef beacon, Lake Michigan, Wisconsin.—A crib was built 9 feet 2 inches high, 40 feet by 40 feet in plan, and was towed to the site, sunk in position in August, and filled to the water level. Concrete in bags was placed upon this. Brick walls of paving brick were erected with concrete backing and loose stone core up to the deck level and concrete coping was placed. The coping was put on 7 blocks to a side. The coping was finished, except a small amount of work, the center was prepared for paving, and materials to complete the work were loaded on the scow in October, 1898. Sixty cords of riprap stone were placed on the north, east, and south sides of the crib, the last 20 cords of which were brought by the light-house tender *Amaranth*, being placed on November 8, 1898. Contracts were made for the erection of

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a tower for a gas beacon on the pier. The metal work for the beacon tower was shipped to Racine for erection. Contracts were made for furnishing and placing 3 gas tanks, with pressure regulators, etc., on the beacon. The work of repairing damage done by ice and completing concrete coping and the brick deck was finished. The metal tower and gas appliances will be erected at an early date and the light will go into operation during this summer.

447. Racine, Lake Michigan, Wisconsin.—A lamp and cleaning house was built and covered with iron. Various repairs were made.

448. Wind Point, Lake Michigan, Wisconsin.—The keeper's dwelling was remodeled and an extension of 34 feet by 28 feet was added, with a back building. The barn was moved and a plank walk was laid from it to the rear of the dwelling. A concrete walk was laid round the new part to connect with that around the tower and old dwelling, and various repairs were made.

450. Milwaukee pierhead, Lake Michigan, Wisconsin.—The elevated walk, which was damaged by the storm of October 25, was repaired. The main walk was carried inshore some 56 feet from the break and then bridged to the light-house crib. The crib pier carrying the keeper's dwelling was thoroughly repaired. The sea wall of the crib was rebuilt and made a foot higher and braced by 8-foot timbers, gained and bolted into the two upper courses at the top and bolted to cross-ties of the pier at the bottom ends. New deck beams and plank were placed in the rear of the wall, 80 feet by 25 feet, and the deck was otherwise repaired. The keeper's dwelling was modified and the second story, consisting of four rooms, was arranged for the accommodation of the assistant light-keeper. Gables were placed in each side of the roof. The old iron lantern and lantern deck were taken down and the walls of the tower were lowered to the intersection of the main roof and roofed over. The iron stairs were removed and the interior of the old tower was ceiled, and a hard-wood staircase with front door was placed for the entrance to the assistant keeper's quarters. Various repairs were made.

—. *Milwaukee breakwater and the harbor of refuge, Lake Michigan, Wisconsin.*—By act of Congress approved March 3, 1899, funds were provided for the completion of this breakwater, and there is reason to believe that the work will be completed in November, 1900; meantime, the Board has provided that a temporary beacon light be established upon the south end of the breakwater with two 5 day lens lanterns showing a red above a white light. A permanent light for the lighting of the breakwater should be provided and should be ready as nearly as possible when the breakwater is completed. The Board is of the opinion that the interests of commerce and navigation require that a fourth-order light should be shown from an iron tower supported by crib and masonry foundations or by a metal caisson filled with concrete, and that a fog-signal should be operated from this point. It is estimated that such structures would cost $75,000, and it is recommended that an appropriation of that amount be made therefor.

453. Port Washington, Lake Michigan, Wisconsin.—Material for repairs was purchased and delivered at the station. A wire fence 255 feet long with steel posts, pickets, uprights, foot gate, and carriage gate was purchased and put up on Powers street and City street lines, and extended about 15 feet around on the west boundary line. Six loads of gravel were placed on the drive through the lot to the barn. Various repairs were made.

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454. Sheboygan pierhead, Lake Michigan, Wisconsin.—Some 255 feet of elevated walk at the inner end of the pier was taken down and replaced by a 3-foot wide plank walk on the pier, with hand rails on one side. The rest of the walk was repaired throughout. Various other repairs were made.

455. Sheboygan, Lake Michigan, Wisconsin.—The smokestack of the watch room of the tower was renewed. A brick oil house with iron shelving, roof, and door was erected.

460, 461. Kewaunee pierhead range, Lake Michigan, Wisconsin.—The beacon was moved 200 feet nearer the outer end of the pier. Some 200 feet of elevated walk was built and 200 feet of the conduit was removed. The gas machine was taken down and shipped to the light-house depot at St. Joseph, Mich., for storage. Two globe valves and a smokestack were provided for signal No. 1 and erected. Minor repairs were made. The following recommendation made in the Board's last three annual reports is renewed:

> This station, which consists at present of range lights and a steam fog-signal, has no dwelling for the keepers. It is estimated that proper structures can be erected for $7,500, and it is recommended that an appropriation of this amount be made therefor.

462, 463. Ahnapee pierhead range, Lake Michigan, Wisconsin.—The timber for an extension of 338 running feet of elevated walk was received, and the work of framing the bents, etc., was well advanced.

464. Sturgeon Bay Canal pierhead, Lake Michigan, Wisconsin.—A plank walk was laid to the canal entrance. Various repairs were made.

465. Sturgeon Bay Canal, Lake Michigan, Wisconsin.—The contractor for the erection of the tower finished his work. The lantern was erected and glazed and the hand rail was put up, and the tower was all completed on October 3, 1898, the work accepted, and the final payment for same made. A third-order lens was received and the illuminating apparatus was set. An estimate of cost for staying the light tower to prevent vibration was prepared and the work for staying, consisting of four anchorages of stone and four wire guys with turn-buckles, was completed. The third-order light was established at this station on the night of March 17, 1899. Plans and estimate for the construction of an oil house of 1,590 gallons capacity were prepared. The metal work for the oil house was built. The oil house will soon be erected. A small dwelling for the assistant keeper is still to be erected to complete this station.

467. Sturgeon Bay Canal, southeast entrance, No. 2, Lake Michigan, Wisconsin.—A light was established on the southwest revetment, southeast entrance to the canal, on August 18, 1898. A house 4 by 4 feet in plan and 7 feet high, for the beacon, was completed, and a plank walk was laid on the southeast side of the canal entrance.

473. Porte des Morts, Lake Michigan, Wisconsin.—The east boat landing was extended 20 feet. The boat ways on the east side of the island were repaired and lengthened 10 feet, and the old cribs were repaired. The dock on the west side of the island was lengthened 30 feet, and the boat ways 12 feet. Three governor springs and six globe valves were purchased for the fog-signal plant. Various repairs were made.

474, 475. Plum Island range, Lake Michigan, Wisconsin.—A well for fog signal water supply was drilled. Storm doors for the fog-signal house were provided. Various repairs were made.

—. *Fisherman Shoal, Lake Michigan, Wisconsin.*—The following recommendation, made in the Board's last three annual reports, is renewed:

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This shoal rock, which is near Rock Island, forms a dangerous obstruction to the increasing number of vessels passing in this vicinity. It is proposed to establish a light and fog signal on this shoal in the interest of this commerce. It is estimated that it can be done for $50,000, and it is recommended that an appropriation of this amount be made therefor.

478. St. Martin Island, Lake Michigan, Wisconsin.—An appropriation of $15,000 was made by the act approved July 1, 1898, for the establishment of a light and fog-signal on this island. The locality was visited in September, 1898, to select a site. Information as to the ownership of the island was obtained from the General Land Office, with a view to purchase a site. Steps will soon be taken to negotiate for a suitable site.

—. *Little Gull Island, St. Martins Passage, entrance to Green Bay, Lake Michigan, Michigan.*—The establishment of a light and fog-signal here, at a cost not to exceed $20,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made.

479. Poverty Island, Lake Michigan, Michigan.—Improvements to the fog-signal water supply and repairs to the machinery were made during July. A long crib was built and provided with wells. A fire plug was fitted and both steam and water pipes and pipe boxes were covered. A small house was built over the fire-plug well, at the outer end of the pier. Valves were provided for the steam pipes at the boiler, steam chests were provided with drain pipes, and injector suctions with couplings. Two smokestacks were provided for the fog-signal boilers. Various other repairs were made.

—. *Pointe aux Barques (Manistique), Lake Michigan, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

> The establishment of the Lake Michigan light and fog-signal vessels, Squaw Island light and fog-signal, Seul Choix Pointe light, and the additional buoyage authorized in the northern part of Lake Michigan has made those waters reasonably safe for navigation on the route from the Straits of Mackinac to Green Bay ports, with the exception of a stretch of 45 miles between Seul Choix Pointe and Poverty Island. Pointe aux Barques is a prominent headland 24⅓ miles northeast one-half north from Poverty Island light, and 23 miles west-southwest from Seul Choix Pointe light. Poverty Island light is visible 16¼ miles, and Seul Choix Pointe is visible 15 miles. There is therefore a space of 13¾ miles off Pointe aux Barques not covered by any light. The town of Manistique, situated at the mouth of Manistique River, at the head of the bay between Seul Choix and Pointe aux Barques, has a large lumber trade and many vessels call at that port. The route north of the Beavers and along the coast down to Poverty Island passage into Green Bay is the usual route of the ore vessels to and from Lake Erie ports in northwest winds, and the shipments of ore this year from Escanaba are largely in excess, it is said, of those of any port in the world. The Board recommends that a coast light and fog-signal be established on Pointe aux Barques, Lake Michigan, Michigan. It is estimated that this can be done for a sum not to exceed $32,000, and it is recommended that an appropriation of this amount be made therefor.

488. Escanaba, Green Bay, Michigan.—An appropriation of $5,000 has been asked for this station, but it is not deemed necessary. A fog bell can be established here at slight cost, there being available a frame tower by reason of changes at Tail Point and a machine and fog bell when the steam fog-signal is established at Muskegon, Michigan.

494. Eagle Bluff, Green Bay, Wisconsin.—The metal work for the oil house was purchased and stored at Sturgeon Bay Canal for delivery here as soon as practicable.

495. Chambers Island, Green Bay, Wisconsin.—There were shipped to the station, for use with the illuminating apparatus, pedestal, mercury, mercury float, gear wheel, and accessories. A notice to mariners announcing a change in the characteristics of the light on or about July 15, 1899, was issued. Minor repairs were made.

498. Sherwood Point, Green Bay, Wisconsin.—Boat rollers were provided and the trees that obstructed the view of the light were cut down. The illuminating apparatus was overhauled and other minor repairs were made.

501. Tail Point, Green Bay, Wisconsin.—Pursuant to an appropriation of $7,500 made by the act approved July 1, 1898, plans and specifications for removing Tail Point light-station were prepared. A contract was made for furnishing the metal work, and other materials were ordered and delivered. The work was commenced on April 15, 1899, and it is so far advanced that it is expected that the light will be exhibited next August. Minor repairs were made to the light apparatus and the keeper's old dwelling.

502. Tail Point pile cluster beacon, Green Bay, Wisconsin.—A temporary pile cluster of three piles was driven in 10 feet of water near the buoy off Tail Point. A light was established November 15, 1898. The pile cluster that was carried away by ice was rebuilt. This light will be discontinued on the completion of Tail Point light-station.

504, 505. Grassy Island range, Green Bay, Wisconsin.—A flag pole was furnished and erected.

506. Elbow beacon, Green Bay, Wisconsin.—A cluster of six piles was driven in 8 feet of water on the east side of the channel, midway between Grassy Island and the wharves at the entrance to Fox River. The light was established on November 15, 1898. This beacon, which was carried away by ice, was rebuilt.

508. Murphys Dock beacon, Green Bay, Wisconsin.—A post light was established at this point on November 15, 1898.

509. Menasha River lower beacon, Little Butte des Morts Lake, Wisconsin.—A platform was built and the old locker from the upper beacon was bolted in place. A notice to mariners announcing that the color of the light would be changed from white to red about July 17, 1899, was issued.

510. Menasha River, upper beacon, Lake Winnebago, Wisconsin.—The Board decided that the color of the light should be changed from white to red, that a lens-lantern should be substituted for the one now in use, and that the light be raised so that it will illuminate the entire horizon. The material was received and the platform was enlarged, and a locker was built and painted. A notice to mariners announced that the color of the light would be changed from white to red about July 17, 1899.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

386. St. Helena, Mich.
392. Skilligallee, Mich.
393. Beaver Island Harbor, Mich.
394. Beaver Island, Mich.
397. South Fox Island, Mich.
401. South Manitou, Mich.
402. Point Betsey, Mich.
405, 406. Portage Lake Pierhead Range, Mich.
408. Manistee, Mich.
415. Petite Pointe au Sable, Mich.
420. Muskegon, Mich.
422. Grand Haven Pierhead, Mich.
423. Grand Haven, Mich.
440. Grossepoint, Ill.
451. Milwaukee, Wis.
456. Manitowoc Breakwater, Wis.
458. Two Rivers Pierhead, Wis.
459. Twin River Point, Wis.
470, 471. Bailey Harbor Range, Wis.
472. Cana Island, Wis.
477. Pottawatomie, Wis.
486. Point Peninsula, Mich.
489. Squaw Point, Mich.
496. Menominee Pierhead, Mich.
497. Green Island, Wis.

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LIGHT-VESSELS.

387. *Simmons Reef light-vessel, No. 55, Lake Michigan, Michigan.*—This steam screw light-vessel was built of wood in 1891, is of about 101 tons burden, and has a steam fog-signal. She left her station on December 14, 1898, and went to Cheboygan, Mich., for the winter. While there she was fitted with a new smokestack and breeching for the main boiler and a smokestack for the auxiliary boiler. The main boiler was covered with asbestus and a canvas jacket; hard-wood floors were laid in the cabin, staterooms, and forepeak; a 50-gallon galvanized-iron water tank was put in, two windows were placed in the after end of the whistle house, and the deck was fitted with prisms for lighting the rooms below. She was supplied with fuel and mineral oil, and is in excellent condition. She returned to her moorings on May 2, 1899.

388. *White Shoal light-vessel, No. 56, Lake Michigan, Michigan.*—This steam screw light-vessel was built of wood in 1891, is of about 101 tons burden, and has a steam fog-signal. She left her station on December 14, 1898, and went to Cheboygan, Mich., for the winter. While there she was fitted with a set of grate bars, nine rivets in the main boiler, and two steel bolts for the cylinder head. The main boiler was covered with asbestus and a canvas jacket; a new floor was laid in the chain locker and hard wood floors in the cabin, staterooms, and forepeak, and the covering board, stanchions, deck, and top sides from the covering board to the water line were thoroughly calked. A 50-gallon galvanized-iron water tank was put in; two windows were put in the after end of the whistle house, and the deck was fittted with prisms for lighting the rooms below. She was supplied with fuel and mineral oil, and is in excellent condition. She returned to her moorings April 28, 1899.

390. *Grays Reef light-vessel, No. 57, Lake Michigan, Michigan.*—This steam screw light-vessel was built of wood in 1891, is of about 101 tons burden, and has a steam fog-signal. She left her station December 14, 1898, and went to Cheboygan, Mich., for the winter. While there she was fitted with hard-wood floors in the cabin, staterooms, and forepeak, a platform was built around the steering wheel, the forward winch was inclosed with one door on each side, two windows were put in the after end of the whistle house, the main boiler was covered with asbestus and a canvas jacket, the top sides of the hull were calked from the water line to the plank sheer, a patch was put on the main boiler and smoke box, she received one new mainsail, and one 50-gallon galvanized-iron water tank was put in, and the decks were fitted with prisms for lighting the rooms below. She was supplied with fuel and mineral oil, and is in excellent condition. She returned to her moorings on April 28, 1899.

487. *Eleven-Foot Shoal light-vessel, No. 60, about midway between Eleven-Foot Shoal and Corona Shoal, Green Bay, Michigan.*—This wooden light-vessel was built in 1893, is of about 100 tons burden, and has a steam fog-signal. She left her station December 6, 1898, and went to Escanaba, Mich., for the winter. While there she was supplied with fuel. No repairs were required. She is in excellent condition. She returned to her moorings on April 29, 1899.

—. *Peshtigo, Green Bay, Lake Michigan, Wisconsin.*—The following recommendation, made in the Board's last annual report, is renewed:

> This shoal lies on the north of Peshtigo River and projects for a long distance into Green Bay. The large and important commerce of the vicinity has for many

years been seriously incommoded by the lack of a reliable mark at the end of the point. It is believed that a light of some kind on the end of Peshtigo Reef, about 4 miles from the shore, would be a valuable aid to navigation. As the water deepens rapidly near the 12-foot curve, it is difficult, if not impossible, to place a gas buoy there, and the liability that such a buoy may be carried away makes the placing of one there, impracticable. The establishment of a light-house on the reef itself would be a dangerous experiment owing to the tremendous push of floating ice in that vicinity. It seems, therefore, that the only practicable way of marking this reef is to establish a light-vessel in the immediate vicinity. This can be done at a cost not exceeding $15,000, and it is recommended that an appropriation of this amount be made therefor.

By the act approved February 15, 1893, the establishment of a light-house with a fog-signal at or near Peshtigo Shoal, Green Bay, was authorized, at a cost not exceeding $10,000, but as no appropriation has been made for the purpose, and as so much time has elapsed since the time of authorization, the question comes up almost as new matter.

FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

384. Old Mackinac Point, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 352 hours and consumed about 50 cords of wood.

387. Simmons Reef light-vessel, No. 55, Michigan.—The 6-inch steam whistle was in operation some 216 hours and consumed about 14 tons of coal and 2 cords of wood.

388. White Shoal light-vessel, No. 56, Michigan.—The 6-inch steam whistle was in operation some 226 hours and consumed about 12 tons of coal and 2 cords of wood.

390. Grays Reef light-vessel, No. 57, Michigan.—The 6-inch steam whistle was in operation some 237 hours and consumed about 9 tons of coal and 3 cords of wood.

391. Waugoshance, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 204 hours and consumed about 9½ tons of coal and 3 cords of wood.

392. Skilligallee, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 264 hours and consumed about 6 tons of coal and 27 cords of wood.

394. Beaver Island, Michigan.—The first-class steam sirens, in duplicate, were in operation some 367 hours and consumed about 50 cords of wood.

397. South Fox Island, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 581 hours and consumed about 42 cords of wood and 43 tons of coal.

400. North Manitou, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 747 hours and consumed 88 cords of wood.

401. South Manitou, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 1,056 hours and consumed 84 cords of wood.

402. Point Betsey, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 479 hours and consumed about 6 tons of coal and 49 cords of wood.

407. Manistee pierhead, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 458 hours and consumed about 33 tons of coal and 4 cords of wood.

412. Ludington pierhead (rear), Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 601 hours and consumed about 52 tons of coal and 5 cords of wood.

422. Grand Haven pierhead, Michigan.—The first class steam sirens, in duplicate, were in operation some 318 hours and consumed about 25 tons of coal and 1 cord of wood.

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429. St. Joseph pierhead (front), Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 275 hours and consumed about 18 tons of coal and 4 cords of wood.

438. Chicago Harbor, Illinois.—The 10-inch steam whistles, in duplicate, were in operation some 312 hours and consumed about 39 tons of coal and 6 cords of wood.

440. Grossepoint, Illinois.—The 10-inch steam whistles, in duplicate, were in operation some 124 hours and consumed about 17 tons of coal and 1 cord of wood.

448. Wind Point, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 473 hours and consumed about 35 tons of coal and 2 cords of wood.

450. Milwaukee pierhead, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 775 hours and consumed about 54 tons of coal and 5 cords of wood.

454. Sheboygan pierhead, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 377 hours and consumed about 33 tons of coal and 2 cords of wood.

456. Manitowoc breakwater, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 835 hours and consumed about 61 tons of coal and 4 cords of wood.

459. Twin River Point, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 606 hours and consumed about 33 tons of coal and 3 cords of wood.

461. Kewaunee pierhead (rear), Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 766 hours and consumed about 58 tons of coal and 2 cords of wood.

464. Sturgeon Bay Canal pierhead, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 733 hours and consumed about 52 tons of coal and 6 cords of wood.

473. Porte des Morts, Wisconsin.—The 10-inch steam whistles, in duplicate, were in operation some 294 hours and consumed about 54 cords of wood.

475. Plum Island (rear), Wisconsin.—The first-class steam sirens, in duplicate, were in operation some 282 hours and consumed about 57 cords of wood.

479. Poverty Island, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 485 hours and consumed about 10 tons of coal and 67 cords of wood.

481. Seul Choix Pointe, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 258 hours and consumed about 29 tons of coal.

482. Squaw Island, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 327 hours and consumed about 22 tons of coal.

487. Eleven Foot Shoal light-vessel, No. 60, Michigan.—The 6-inch steam whistle was in operation some 156 hours and consumed about 6 tons of coal and 1 cord of wood.

496. Menominee pierhead, Michigan.—The 10-inch steam whistles, in duplicate, were in operation some 109 hours and consumed about 10 tons of coal and 4 cords of wood.

BUOYAGE.

The buoyage of the district is in excellent condition and is attended by the light-house tender *Dahlia*, except Bank Point buoy, Muskegon

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Lake, which is done by contract; buoys at St. Joseph Harbor, which are cared for by the custodian of the light-house depot, and the buoys in Green Bay south of Long Tail Point and channel buoys in Fox River, which are attended to by contract.

Winslow Shoal buoy.—A 30-foot black spar buoy in 33 feet of water, 300 feet north of the wreck of the schooner *Winslow*, Straits of Mackinac, Lake Michigan, was established September 11, 1898.

Winslow gas buoy.—A gas buoy painted black was substituted for the spar buoy marking the wreck of the schooner *Winslow* September 20, 1898.

Rodgers wreck buoy.—A 35-foot red and black horizontally striped spar buoy in 46 feet of water, on the northerly side of the wreck of the schooner *A. J. Rodgers*, in Grand Traverse Bay, was established October 21, 1898.

Bailey Harbor wreck buoy.—A 25-foot black spar buoy on the northerly side of and close to a sunken wreck in Bailey Harbor, Lake Michigan, was established on October 3, 1898.

Entrance gas buoy, No. 1.—A gas buoy painted black, showing a fixed white light during periods of 8 seconds, separated by eclipses of 6 seconds, was substituted for Entrance buoy, Straight Channel, No. 1, Green Bay, Wisconsin, without change of position, on July 30, 1898.

Elbow gas buoy, No. 12.—A gas buoy painted red, showing a fixed white light, was substituted for Eighth buoy, No. 12, Green Bay, Wisconsin, without change of position, on July 30, 1898.

DEPOTS.

St. Joseph, Michigan.—The custodian's dwelling was repaired. A lightning rod and point were purchased for erection on the flagstaff for protection of the depot buildings. A contract was made for dredging in front of the light-house depot and 3,600 cubic yards of material were removed. Contract was made for some 80 feet of revetment on the east side of the depot grounds for the protection against the encroachment of the water front. A walk was built to the boat landing under the railroad bridge. Four piles were furnished and driven and a platform was constructed for a mooring place for the scow to protect the landing from the action of the sea.

All supplies received from the general depot at Tompkinsville, N. Y., and those purchased for the district and all blanks and stationery were packed, shipped, and issued to the tender for distribution from the depot. The grounds were improved with trees and seeding. Iron pipe was put in and fire attachments were made with the city water with hose in storehouse and the hydrants at the wharf, so that every portion of the site can be reached, and connection was made so that it can be used by the tender when she is at the dock. The boat landings were repaired and a new one was made. A flag pole from the wreck of the steamer *Duluth*, 110 feet high, was erected, with aluminum ball and lightning rod.

Charlevoix, north end Lake Michigan, Michigan.—Pursuant to the appropriation of $15,000, made by the act approved on July 1, 1898, for a depot, a site for a buoy and supply depot at Charlevoix, Mich., was purchased. The title papers were approved by the United States Attorney-General and duly recorded. The site was plotted. General plans and an estimate of cost for the construction of the depot were prepared. Detail plans, specifications, and forms for advertising for the construction of the revetment and for dredging a basin, and for filling at the depot, were prepared and bids for doing the work were invited. The work is to be done so that the depot can be of service this fall.

Depot for the Ninth light-house district.—This district is the only lake district which is kept in operation during the winter. This change has been made necessary as steamers, contrary to the former custom, ran during the winter months throughout more than half of the area of the district. The Board has no place where the recently chartered tender *Arcadia* can lie and take on material for construction and repair of light-houses. This hampers and interferes with the work of the district. The light-house depots at Charlevoix and St. Joseph are not avaliable, as they are far from the office of the engineer of the Ninth light-house district and from the best markets for material. A suitable site for a light-house depot can be purchased at or near Milwaukee. This depot would afford wharves for the light-house tenders of both the light-house inspector and engineer, where they could tie up during the winter when not in use. The inspector with difficulty finds temporary accommodations at Chicago wharves for his tender. There is no place more accessible than Milwaukee where it can make its headquarters. It is estimated that a light-house depot could be established at Milwaukee for not exceeding $50,000, and the Board recommends that an appropriation of this amount be made therefor.

TENDERS.

Amaranth.—This iron tender was built in 1891–92 and is of 488 net tons burden. The engineer of the district used her to deliver material at the following-named stations when they were duly inspected:

Poverty Island, Point Peninsula, Pottawatomie, Pilot Island, Cana Island, Sturgeon Bay Canal, McGulpin Point, Sheboygan, Calumet, St. Joseph, Milwaukee pierhead, Milwaukee, Wind Point, Racine, South Haven, Kalamazoo, Holland, Grand Haven, Muskegon, White River, Petite Point au Sable, Pentwater, Ludington pierhead, Grande Pointe au Sable, Manistee, Portage Lake, Michigan City, Grossepoint, Port Washington, Chicago lights, Kenosha, Waukegan, South Fox Island, North Manitou, Charlevoix, Beaver Island, Old Mackinac Point, Skilligallee, Grand Traverse, Manitowoc, Twin River Point, Ahnapee, Porte des Morts, and Kewaunee. During the season of 1898 to the time when the district office was transferred to Milwaukee she delivered 900 tons of material, steamed some 1,596 miles, and consumed about 125 net tons of bituminous coal.

Dahlia.—This iron side-wheel steamer was built in 1874, and is of about 333 tons burden. She has taken in and placed buoys, made trips of inspection, and delivered supplies, in doing which she has steamed about 12,900 miles at a consumption of about 636 gross tons of coal. Additions and repairs were made to the main boiler and the donkey boiler, and various repairs were made to the other machinery. The ship was docked and her bottom was cleaned and well covered with two coats of red lead.

The new tender.—An appropriation of $85,000 was made by the act approved on March 3, 1899, for a new tender for supply and inspection purposes. Plans and specifications are being prepared.

Tender for the engineer of the Ninth light-house district.—The steam barge *Arcadia* was chartered for use as a light-house tender for repair and construction purposes in this district for the season, from July 1, 1899. She was built of wood at Milwaukee in 1888, is of 146 net tons burden, is about 118 feet long, about 26 feet in breadth, of about 9 feet depth, and has estimated 146 horsepower.

The following recommendation, made in the Board's last annual report, is renewed:

> There is now no tender for the engineer service of this district. Formerly this service was performed by two tenders under the direction of the engineer stationed at Detroit. One of these tenders, the *Warrington*, has been transferred to the engineer of the Tenth light-house district and is now stationed at Buffalo. The increasing work of the Ninth and Eleventh districts has made it necessary to detail a separate officer as engineer of the Ninth district, who is stationed at Milwaukee. It is indispensable that this officer be provided with a steamer, that he may attend to the maintenance of the aids to navigation on Lake Michigan and that portion of Green Bay within his jurisdiction. It is estimated that a steamer can be built for this purpose for not exceeding $85,000, and it is recommended that an appropriation of this amount be made therefor.

During the year every station and light-vessel in the district was inspected at least twice; all were found in efficient condition. All the coast lights and fog-signals south of and including Beaver Island on the east, and all the coast lights and fog signals south of and including Seul Choix Pointe on the west coast of Lake Michigan, were kept in operation the entire winter, and the light and fog signal at Old Mackinac Point, Michigan, were kept in operation until the ice in the straits was solid and the steam ferry running between Mackinaw City and St. Ignace having made a channel, they were no longer necessary.

10

TENTH DISTRICT.

district extends from the mouth of the St. Regis River, St. ce River, New York, to the mouth of the River Rouge, Detroit Michigan. It embraces all aids to navigation on the United shores and waters of Lakes Erie and Ontario and the upper part St. Lawrence, the Niagara, and the lower part of the Detroit

ctor.—Commander Franklin Hanford, United States Navy.
neer.—Maj. T. W. Symons, Corps of Engineers, United States

is district there are—

ouses and beacon lights	80
essels in position	4
nals operated by steam	8
nals operated by clockwork	6
hted buoys in position	20
uoys in position	134
r *Haze*, buoy tender, and for supply and inspection	1
barge *Warrington*, for construction and repair	1

of the lights in the district, except that at Presqu'ile and the lights at Conneaut, were extinguished or allowed to burn out at lose of navigation in December, 1898, and were relighted between h 27 and April 25, 1899. The Presqu'ile and Conneaut lights maintained during a portion of the winter, as required, for the fit of a car ferry line from Conneaut, Ohio, to Canada.

e light-stations, light-vessels, and buoys of the district were visited inspected as frequently as practicable, at least three inspections g made at each station. All stations were supplied with stores in and June, 1899.

al and wood for stations requiring fuel were supplied either in July August, 1898, or in May and June, 1899.

LIGHT STATIONS.

4. *Cross Over Island, St. Lawrence River, New York.*—On the open- of navigation, 1899, the color of the tower was changed from brown white. Various repairs were made.

—. *Oak Point, St. Lawrence River, New York.*—The following recom- ndation, made in the Board's last three annual reports, is renewed:

> Range lights are needed to guide vessels clear of the rocky shoals near the main annel of the river at Oak Point, between Ogdensburg light and Cross Over Island ht. It is estimated that these can be established for $10,000, and it is recom- ended that an appropriation of this amount be made therefor.

46. *Sister Islands, St. Lawrence River, New York.*—An extension to e boathouse was built to provide storage room for fuel. The masonry all along the shore at the easterly end of the island was repaired and ebuilt, and the shore line was further protected by stone riprap.

47. *Sunken Rock, St. Lawrence River, New York.*—On the opening of avigation, the color of this light was changed from white to red, and the color of the tower from brown to white.

49. *Rock Island, St. Lawrence River, New York.*—A 1½-horsepower oil engine, with pump attached, was purchased for use in supplying

Tenth District.

water from the river for domestic use and to protect the station buildings against fire. On the opening of navigation, the color of the tower was changed from brown to white.

—. *Chapman Shoal, St. Lawrence River, New York.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> This shoal is of solid rock, the top of which is awash at ordinary stages of water. It stands in mid-channel between Beckwith Island and North Colborne Island, and forms a dangerous obstruction. It is proposed to establish here a light and fog-signal station. It is estimated that this can be done for $25,000, and it is recommended that an appropriation of this amount be made therefor.

52. *Carlton Island, St. Lawrence River, New York.*—The buildings were completed, including a mast for suspending the light, which was first exhibited on the opening of navigation, 1899. Some 121 feet of board and 253 feet of gravel walks were laid, connecting the station structures with each other.

54. *Tibbetts Point, St. Lawrence River, New York.*—To provide a nearer water supply for fog signal use, an excavation was made in the rock below water line, and covered over by a crib, bolted to the rock. A new steam-pump was purchased, and alternations in the fog-signal apparatus were made, so that either whistle can be operated with either boiler or automatic signal. Various repairs were made.

The following recommendation made in the Board's last annual report is renewed:

> The families of the two keepers are living in one small dwelling, much to the discomfort of both. A new dwelling for the assistant keeper is much needed. It is estimated that a proper structure could be built for not exceeding $3,500, and it is recommended that an appropriation of this amount be made therefor.

57. *Galloo Island, Lake Ontario, New York.*—The assistant keeper's dwelling was rebuilt. Earthen pipe sewers leading from both keepers' dwellings were laid. The fog-signal apparatus was so altered that either whistle could be operated with either boiler or automatic signal apparatus. Various repairs were made.

59. *Oswego, Lake Ontario, New York.*—About 40 feet of face pier northeast of the mainlight was rebuilt from below the water level to the deck.

61, 62. *Fair Haven, entrance to Little Sodus Bay, Lake Ontario, New York.*—A lens lantern was substituted for the tubular lantern of the inner pierhead beacon. An oil house was provided. Various repairs were made.

63–65. *Big Sodus, at Sodus Point, Lake Ontario, New York.*—Some 108 feet of sewer was relaid, and various repairs made to the keeper's dwelling.

66, 67. *Genesee, Charlotte Harbor, Lake Ontario, New York.*—The 58 flues of the fog-signal boiler were replaced, and on April 3, 1899, the characteristic of the rear range light was changed to fixed red shown with one lens lantern.

68. *Braddock Point, Lake Ontario, New York.*—The 180 degree 3½-order lens was removed and a 270-degree lens was installed in its place, so that now the light can be seen from all points of approach from the lake. Various repairs were made.

72. *Fort Niagara, Niagara River, Lake Ontario, New York.*—Some 74 feet of iron hand rail was put up in the stairway of the tower. Some 289 running feet of sidewalk was built. Various repairs were made.

The Niagara River is difficult to enter in bad weather and on dark nights. A small light at the mouth of the river where it empties into Lake Ontario would materially decrease the danger in making the port, and would increase the value of the Niagara River as a harbor of refuge. At present there is no refuge for vessels drawing more than 10 feet of water on the south shore of Lake Ontario between the Genesee River and Port Dalhousie except the Niagara River. It is estimated that a tower 25 feet high, located on United States land, showing a light covering the range of visibility needed by mariners, would cost about $2,000 to establish. The Board therefore recommends that an appropriation of $2,000 be made therefor.

73, 74. *Niagara River range, Niagara River, New York.*—The rear beacon of this range was rebuilt and surrounded by a substantial iron fence. A lens lantern was substituted for the reflector lantern, so that not only is a better light shown at night, but its conspicuousness as a day mark is largely increased. Various repairs were made to the front-range beacon.

75. *Horseshoe Reef, entrance to Buffalo Harbor, New York.*—About 220 tons of stone, weighing from 3 to 4 tons each, were placed along the south side of the pier foundation and protection crib to shield the station from the force of the seas.

76. *Buffalo breakwater, north end, Lake Erie, New York.*—The tower lantern was raised 12 feet. The light will now be less obscured in the direction of Buffalo Harbor and should be seen from a greater distance on the lake. This improvement includes the construction of a watchroom beneath the lantern, the removal of the oil room and clockwork operating the fog-bell to the space beneath the dwelling, which was inclosed for the purpose. A new smokestack was provided for the fog-signal boiler. Various repairs were made.

77. *Buffalo, main entrance to Buffalo Harbor, New York.*—The keeper's dwelling was rebuilt.

78. *Dunkirk, Dunkirk Harbor, Lake Erie, New York.*—The bathroom was connected with the sewer and city waterworks. A 40-gallon hot-water tank was placed in the kitchen. A galvanized-iron fence was built on the east and northerly side of the light-house lot. An iron oil house was erected. Various repairs were made.

79. *Dunkirk pierhead, entrance to Dunkirk Harbor, Lake Erie, New York.*—The foundation pier was rebuilt. It consists of a crib substructure and stone and concrete superstructure. The construction of a new beacon upon this foundation is under contract to be completed by August 31, 1899.

80. *Presqu'ile peninsula fog-signal station, west of entrance to Presqu'ile Bay (Erie Harbor), Lake Erie, Pennsylvania.*—This station, just established, is located near the water line about 1¼ miles westerly from the beacon on the outer end of the north pier entrance to Presque Ile Bay (Erie Harbor). The station consists of a fog-signal house, in which have been installed duplicate steam-water tube boilers and apparatus complete, including 10-inch whistles and Crosby automatic apparatus for regulating the signals. They will be ready for operation by August 1, 1899.

83. *Presqu'ile Pierhead, Erie Harbor, entrance to Presqu'ile Bay, Lake Erie, Pennsylvania.*—A section of the superstructure of the pier in front of the buoy shed was rebuilt from below the water level. Various repairs were made.

The keeper's dwelling is old, dilapidated, and not large enough to accommodate the two keepers. The old building can be so repaired as to accommodate one keeper, but a new dwelling should be erected for the principal keeper. This it is estimated can be done for $3,500, and it is recommended that an appropriation of this amount be made therefor.

87. *Presqu'ile, entrance to Erie Harbor, Lake Erie, Pennsylvania.*—Some 300 feet of walk leading to the boat landing were rebuilt. Two 1-ton differential pulley blocks were provided in the boathouse for taking the boat from the water. The color of the tower was changed from red to white to make it more conspicuous as a day mark. Various repairs were made.

88, 89. *Conneaut, entrance to Conneaut Harbor, Lake Erie, Ohio.*—The illuminating apparatus of the two range beacons was provided with modified lamps having fifth-order burners, thus increasing the brilliancy of the lights. Various repairs were made.

90, 91. *Ashtabula, entrance to Ashtabula Harbor, Lake Erie, Ohio.*—The bathroom was connected with the sewer and the water works. The color of the rear range light was changed to fixed red, and it was shown with a lens lantern since the opening of navigation, April 11, 1899. The 6-inch steam whistle of the fog-signal was replaced with a 10-inch whistle, at an increased height of 10 feet. A new smokestack was provided.

93, 94. *Fairport Pierhead, entrance to Fairport Harbor, Lake Erie, Ohio.*—A temporary open framework tower was erected to replace the skeleton iron rear range beacon, overthrown by the collision of a vessel on September 13, 1898, and the color of the light was changed to fixed red, and it was shown from a lens lantern on and since September 23, 1898. Various repairs were made.

—. *Cleveland, on the hill at the east side of Cleveland Harbor, Ohio.*—The following recommendation, made in the Board's annual report for 1894 and again in 1898, is renewed:

> The illuminating apparatus remains in the tower in the same position it occupied before the light was discontinued at the close of navigation in 1892. The dwelling is, however, the only place at present provided for the keepers of the harbor lights and fog-signal. The house is in the city, at the corner of Main and Water streets, on the high level, and affords no view of either of the lights. The distance from the dwelling to the nearest of four lights is about two-thirds of a mile; and to the breakwater light, with revolving apparatus and fog signal, the distance is about a mile by the route which must be followed. The distance is a matter of great inconvenience to the keepers, and sometimes of danger to the lights. The present dwelling, though an excellent house, is entirely unsuited to the use of several keepers. It is recommended that a site be constructed for the dwelling and storehouse by filling in the water adjacent to the west pier. The storehouse is much needed. A suitable dwelling can then be built in a place convenient to the lights. It is proposed, when the new dwelling is completed, to sell the old site and buildings. Inquiry regarding value of real estate in the vicinity of the present light-house site and dwelling indicate that the old site may be sold for about $24,000 or $25,000. The expense of the new site, dwelling, and storehouse is estimated to be $25,000, and it is recommended that an appropriation of this amount be made therefor.

96. *Cleveland West Breakwater, east end, Ohio.*—The old locomotive boiler and fog signal were replaced with duplicate apparatus throughout, consisting of steam boilers, pumps and Crosby automatic signals. During the progress of the work, from the opening of navigation until June 1, 1898, when steam signals were resumed, fog-signals were made with a bell. A storeroom addition was built to the fog-signal house. Various repairs were made.

99, 100. *Black River range lights, entrance to Black River Harbor, Lake Erie, Ohio.*—Some 80 feet of elevated walk on the west pier was rebuilt.

Tenth District.

The color of the rear range light was changed to fixed red, shown with a lens lantern since March 27, 1899. Various repairs were made.

102. Huron, entrance to Huron Harbor, Lake Erie, Ohio.—About 110 feet of elevated walk on the west pier and 400 feet of sidewalk on the street along two sides of the light-house lot were rebuilt.

113. South Bass Island, Lake Erie, Ohio.—A wire fence was built from shore to shore along the boundary line on the northerly side of the light-house lot. Various repairs were made.

116. Port Clinton, entrance to Port Clinton Harbor, Lake Erie, Ohio.—The keeper's dwelling is unsightly, uncomfortable, and unhealthful. It is in bad repair and unfit for human habitation. It is estimated that a suitable dwelling can be built for $3,000, and the Board therefore recommends that an appropriation of this amount be made therefor.

119. Toledo Harbor, entrance to Straight Channel, Maumee Bay, Lake Erie, Ohio.—The plans for the structures for this station were practically completed, and as soon as practicable the work will be advertised to be done under contract.

The following recommendation, made in the Board's last annual report, is renewed:

> By the act approved July 1, 1898, an appropriation of $37,500 was made for constructing a light and fog-signal station to mark the outer end of the main channel, entrance to Toledo Harbor, and authority was given by the same act to contract for the station in a sum not to exceed $75,000. The work will be done as soon as practicable. It is estimated that $37,500 will be needed to satisfy the contracts made under the authority given in the above-mentioned appropriation, and it is recommended that an appropriation of that amount be made therefor.

121, 122. Straight Channel ranges, Maumee Bay, Lake Erie, Ohio.—The two iron towers the construction of which was begun last year were completed, and from their three lanterns fixed white fifth-order lights were exhibited on October 12, 1898, on which date the two lens-lantern lights before in use were discontinued. An iron oil house was erected.

124, 125. Manhattan range, Maumee Bay, Lake Erie, Ohio.—A walk about 593 feet long with an iron hand rail was built upon small cribs from the front range beacon to the shore. A brick cistern, with a capacity of about 1,525 gallons, was built. An iron oil house was erected. Various repairs were made.

126. Monroe, entrance to River Raisin, Lake Erie, Michigan.—A section of the superstructure of the pier on the north side of the keeper's dwelling was rebuilt above the water level. Various repairs were made.

127. Detroit River light-station, mouth of Detroit River, Lake Erie, Michigan.—This light-house which marks the entrance to the Detroit River from Lake Erie is on a stone pier in Lake Erie, 6 miles from the nearest provision market, which is Amherstburg, Canada, and 9 miles from South Rockwood, Mich., which is the nearest market in the United States. The keepers can land only in good weather, and are sometimes prevented from returning for several days while waiting for weather in which it would be safe for them to attempt the trip on the open lake. They now have to leave their boats on the shore, when they land, unprotected from the weather and from thieves. A boathouse on the mainland is needed for the use of the keepers when they land to get their supplies and their mail. It is estimated that to purchase the necessary land and erect a suitable boathouse will cost not exceeding $1,000. The Board therefore recommends that an appropriation of this amount be made therefor.

135, 136. Grosse Isle (north channel) range, Detroit River, Michigan.—

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The following recommendation, made in the Board's last five annual reports, is renewed:

> The site was paid for and the beacons were completed, but funds have not permitted the erection of a dwelling. The beacons are situated near the north end of the island, where the houses are almost exclusively owned and occupied by summer residents, and there is no place where a keeper can live within a reasonable distance. The construction of a dwelling is therefore essential to the proper maintenance of the lights. A suitable dwelling may be constructed for $3,500, and an appropriation of that amount is recommended for that purpose.

137, 138. Grosse Isle (south channel) range, Detroit River, Michigan.—The following recommendation, made in the Board's last six annual reports, is renewed:

> A new dwelling is needed for the keeper of this range. He is now living in a dwelling on Mamajuda, which is not only unsuitable for the purpose, but is too far away. It is deemed dangerous for the keeper to live on the side of the channel opposite to the lights. A proper dwelling can be built on a foundation partially in the water for not exceeding $5,000, and it is recommended that this amount be appropriated for that purpose.

139, 140. Mamajuda range lights, Detroit River, Michigan.—The tops of piles of the foundation of the boathouse were cut off below the water level, and replaced with dimension posts stayed in place with braces. Various repairs were made.

141, 142. Grassy Island (south channel) range, Detroit River, Michigan.—The east side of the embankment forming the walk south from the rear range light was revetted with riprap stone as far as it is at present exposed to the swash of the water. Various repairs were made.

143, 144. Grassy Island (north channel) range, Detroit River, Michigan.—The channel side of the embankment, forming a walk between the front and rear beacons, was riprapped with stone for a distance of about 720 feet. Various repairs were made.

145, 146. Ecorse range, Detroit River, Michigan.—The embankment between the front and rear beacons of this range was riprapped with stone for a portion of its length on either side to protect it against washing away by wave action.

The following recommendation made in the Board's last four annual reports is renewed:

> The lights of this range are located on the flats, in water about 3½ feet deep, in front of a wide marsh. The nearest place where a keeper could reside is in the village of Ecorse, about three-fourths of a mile distant in a direct line. If he should live there it would be necessary to row fully a mile. This would be quite difficult at times, as the ice forms and remains in the shallow water while the main channel is open. The light-house reservation, which is 100 feet wide and about 700 feet long, is entirely submerged, and the bottom is so soft that a secure foundation can be had only upon piles protected with riprap stone. It is indispensable to the proper care of this station that the keeper live on its site. This can be made possible only by the erection here of a keeper's dwelling. It is estimated that a suitable one can be erected for $5,000, and it is recommended that an appropriation of this amount be made therefor.

REPAIRS.

Repairs more or less extensive were made at the following-named light-stations:

41. Ogdensburg, N. Y.
56. Sacketts Harbor, N. Y.
60. Oswego Breakwater, N. Y.
69. Oak Orchard, N. Y.
70. Thirty Mile Point, N. Y.
95. Cleveland East Breakwater, Ohio.
97. Cleveland East Pier, Ohio.
98. Cleveland West Pier, Ohio.
101. Vermilion, Ohio.
106. Sandusky Bay, inner range, Ohio.
111. Marblehead, Ohio.
117. West Sister Island, Ohio.
118. Turtle Island, Ohio.
127. Detroit River, Mich.

135, 136. Grosse Isle (north channel), Mich.

137, 138. Grosse Isle (south channel), Mich.

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LIGHT-VESSELS.

128. Bar Point light-vessel, No. 59, Detroit River, Michigan.—This wooden light-vessel, which was built in 1893, is of about 101 tons burden and has a steam fog-signal. She used 157 gallons of oil and 20 tons of coal. She was removed from her station by heavy drifting ice on December 11, 1898. After drifting about in the ice at the western end of Lake Erie for ten days, she was rescued and taken to Detroit, Mich., on December 21, 1898, where she was laid up for the winter at the Eleventh district light house depot. She was on April 15, 1899, replaced on her station, about 100 feet to the eastward of her former position.

129. Limekiln Crossing light-vessel (south), No. 64, Detroit River, Michigan.—This wooden scow, used as a light-vessel, was built in 1893, is of about 16 tons burden, and has a bell for a fog-signal. There were used on her 29 gallons of oil and 2 tons of coal. She was removed from her station on December 10, 1898, laid up for the winter at the Eleventh light-house district depot at Detroit, Mich., and replaced on her station April 19, 1899. She was run into and damaged three times by passing vessels during July and August, 1898. On August 29, 1898, she was temporarily withdrawn for repairs and upon their completion was replaced September 7, 1898, a lantern on a float having been substituted for her meanwhile.

130. Limekiln Crossing light-vessel (north), No. 65, Detroit River, Michigan.—This wooden scow, used as a light-vessel, was built in 1893, is of about 16 tons burden, and has a bell for a fog-signal. There were used on her 26 gallons of oil and 2 tons of coal. She was removed December 10, 1898, laid up for the winter at the Eleventh light-house district depot at Detroit, Mich., and replaced on her station April 19, 1899.

134. Ballard Reef light-vessel, No. 63, Detroit River, Michigan.—This wooden scow, used as a light-vessel, was built in 1893, is of about 16 tons burden, and has a bell for a fog-signal. There were used on her 61 gallons of oil and 2 tons of coal. She was removed December 10, 1898, laid up for the winter at the Eleventh light-house district depot at Detroit, Mich., and replaced on her station on April 19, 1899.

FOG-SIGNALS OPERATED BY STEAM OR HOT AIR.

54. Tibbetts Point, St. Lawrence River, New York.—The 10-inch steam whistle, in duplicate, was in operation some 160 hours during the year and consumed about 6 tons of coal.

57. Galloo Island, Lake Ontario, New York.—The 10-inch steam whistle, in duplicate, was in operation some 76 hours and consumed about 7 tons of coal.

66. Genesee Range (front), Lake Ontario, New York.—The 6-inch steam whistle was in operation some 57 hours and consumed about 6 tons of coal.

76. Buffalo Breakwater (north end), Lake Erie, New York.—The 10-inch steam whistle was in operation some 605 hours and consumed about 33 tons of coal.

80. Presqu'ile peninsula, Lake Erie, Pennsylvania.—This fog-signal station is soon to be established. It will be a 10-inch steam whistle, in duplicate, sounding blasts of 5 seconds duration followed by silent

Tenth District.

intervals of 25 seconds. The work of installing it is in progress and the boilers are nearly ready to test.

90. Ashtabula Range (front), Lake Erie, Ohio.—On May 25, 1899, the 6-inch whistle formerly at this station was changed to a 10-inch steam whistle and the whistle was raised 10 feet above its former height. It was in operation some 81 hours and consumed about 6 tons of coal.

96. Cleveland West Breakwater (east end), Lake Erie, Ohio.—The 10-inch steam whistle, in duplicate, was in operation some 522 hours and consumed about 28 tons of coal.

127. Detroit River (Bar Point), Lake Erie, Michigan.—The 10-inch steam whistle, in duplicate, was in operation some 122 hours and consumed about 11 tons of coal.

128. Bar Point light-vessel, No. 59, Lake Erie, Michigan.—The 6-inch steam whistle was in operation some 64 hours and consumed about 4 tons of coal.

FOG BELLS OPERATED BY CLOCKWORK.

Fog bells operated by clockwork are in use at Oswego Breakwater, Fair Haven, Erie Pierhead, Genesee, and Buffalo Breakwater, N. Y., and Cleveland, Ohio. At the three last-named stations the signals are made with the bells only when the use of the steam whistles is temporarily suspended.

BUOYAGE.

The important changes in buoyage since June 30, 1898, are the substitution of three gas buoys for other buoys and the placing of five buoys to mark the channel into the newly dredged harbor at Dunkirk, N. Y. The number of gas buoys in the district will soon be increased from 20 to 23 by the substitution of such buoys in place of others at Galloo Island Shoal, Lake Ontario, N. Y.; Peach Orchard Point, Lake Erie, Ohio, and Kelleys Island South Shoal, Lake Erie, Ohio. The supply of gas for these buoys in Lake Erie was procured at Detroit and the buoys were filled from the tanks on the tender *Haze*. The experiment of getting a supply of gas for the St. Lawrence River and Lake Ontario buoys from Syracuse, N. Y., by rail, in two large tanks, has proved successful. These tanks when filled at Syracuse are sent to Cape Vincent, N. Y., where they are stored until the *Haze* arrives to transfer the gas from the tanks to the buoys. The freight charges on these two tanks from Cape Vincent to Syracuse and return amount to more than the cost of the gas, but no cheaper method of procuring the gas is available. All the buoys in Lake Erie are cared for by the tender *Haze*. The buoys in Lake Ontario and the St. Lawrence River and part of those in the Niagara River are cared for by contract.

The general condition of the buoyage of the district is good. The number of buoys found adrift or displaced during the year was small. Several of the gas buoy lamps gave out and were sent to the company from which the buoys were purchased, for repairs. The question as to how long these lamps with their regulating apparatus should function properly, under actual service, without requiring repairs other than can be made by the officers of the tender, is an important one. Owing to the comparatively short time they have been in use, sufficient data have not as yet been obtained to answer the question. It now appears that after three years service they may be expected to need a thorough overhauling.

Tenth District.

DEPOTS.

Rock Island, St. Lawrence River, New York.—Two snubbing posts have been set in the old part of the wharf. A car track was laid on the new extension to the wharf. An overhead track and trolley were put up in the buoy shed.

Buffalo, Lake Erie, New York.—By the act approved March 3, 1899, $50,000 was appropriated for repairing and enlarging the light-house depot at Buffalo. Plans for repairs to the slip and the wharf and for the storehouses are well advanced, and it is expected the work will be completed during the ensuing year.

Erie (Presqu'ile pierhead) Lake Erie, Pennsylvania.—The buoy shed is old, but in a fair state of repair. About 65 running feet of superstructure of pier in front of the buoy shed was rebuilt above the water line.

Sandusky Bay (Cedar Point), Lake Erie, Ohio.—The buoy shed and wharf which were remodeled in 1898 are in good condition.

Maumee Bay, Lake Erie, Ohio.—The buoy shed is old, but in fair repair.

TENDER.

Haze.—This wooden screw steamer was built in 1876, is of about 274 tons burden, and is the only tender in the district. She is used as a supply vessel and buoy tender, and also to carry the Inspector on his quarterly visits to the light stations. She was extensively repaired in 1895-96, had certain necessary repairs to her deck and sides in February, 1899, and was docked in June, 1899, when such additional work as was needed on the under-water part of her hull was completed. The work of the district has increased so much of late years, especially in the direction of an increasing number of gas buoys requiring frequent attention, that it is with great difficulty that it can be accomplished with the *Haze* alone. In fact there is considerable work required in the matter of verifying bearings and positions of buoys and stations, rewriting sailing directions, etc., which can not be done owing to the large amount of other work on hand for the tender which must not be neglected. The *Haze* was laid up in winter quarters at Detroit, Mich., December 22, 1898, and resumed work March 15, 1899. She steamed some 6,269 miles during the year and consumed about 309 tons of coal.

Tender for the Tenth light-house district.—The following recommendation, made in the Board's last two annual reports, is renewed:

> A new modern vessel is greatly needed in this district. The *Haze* is not only too old to be of much further service, but she is not large enough to do the increased and still further increasing work of the district. It is estimated that a proper tender can be built for not exceeding $85,000, and it is recommended that an appropriation of this amount be made therefor.

Warrington.—This wooden steam screw barge was built in 1868 and is of 300 tons burden. Excepting during the period November 19, 1898, to April 30, 1899, when laid up for the winter, she was engaged in inspecting and making repairs and improvements at various light-stations, including the delivery of four iron oil houses for Manhattan and Maumee Bay, Ohio, and Dunkirk and Fair Haven, N. Y., light-stations. She has steamed some 2,350 miles during the year and consumed about 615 tons of coal. She was painted outside and inside.

Tenth District.

OIL HOUSES.

Four iron oil houses were provided, one for each of the following-named light-stations: Manhattan, Ohio; Maumee Bay Ranges, Ohio; Dunkirk, N. Y., and Fairhaven, N. Y.

The following-named light-stations are among those in the greatest need of isolated fire-proof oil houses: Genesee, N. Y.; Fairport, Ohio; Grassy Island (north channel), Michigan; Conneaut, Ohio; Vermilion, Ohio; Buffalo, N. Y.; Sister Islands, New York.

The estimated cost of erection is $350 for each station.

ELEVENTH DISTRICT.

s district extends from the mouth of the River Rouge, Detroit , Michigan, to the westerly end of Lake Superior. It embraces ds to navigation on the United States shores and waters of Lakes lair, Huron, and Superior, the upper part of the Detroit River, t. Clair and St. Marys rivers, and that part of the Straits of Macki- ying to the eastward of a line drawn across the straits just to the ward of Old Mackinac Point light-station, Michigan.

spector.—Lieut. Commander Duncan Kennedy, United States Navy, ngust 10, 1898; Commander Franklin Hanford, United States Navy, ugust 31, 1898; Lieut. Commander F. O. Davenport, United States y, to October 17, 1898; since then Commander Duncan Kennedy, ed States Navy.

ngineer.—Maj. Milton B. Adams, Corps of Engineers, United States y, to March 25, 1899; since then Maj. Thomas H. Handbury, Corps ngineers, United States Army.

here are in the district—

t-houses and beacon lights, including 17 post lights	222
t-vessels in position	3
or unlighted beacons	1
-signals operated by steam	30
-signals operated by clockwork	5
-lighted buoys in position	10
buoys in position	3
er buoys in position	376
amer *Marigold*, buoy tender, and for supply and inspection	1
amer *Amaranth*, for construction and repair	1
am launch *Lotus*, for construction and repair	1

LIGHT-STATIONS.

147. *Belle Isle, Detroit River, Michigan.*—The light-house grounds ere graded and seeded in grass.

150. *Windmill Point, Detroit River Michigan.*—The material necessary rebuild the barn and repair the boat landing was delivered and the ork was completed in May. Various repairs were made.

151, 152. *Isle aux Pêches Range, Lake St. Clair Twenty-foot Channel, ichigan.*—These lights, established April 15, 1898, and carried away y ice in the spring of 1899, were reestablished on April 26, 1899. The riving of the piles was completed on April 20, 1899. The platform, targets and masts for the beacons were placed in position April 22, 1899. The lantern carriages were also fitted and hung. The front beacon consists of three piles 40 feet long, driven in a triangle of 5 feet centers in about 19 feet of water. The focal plane is 18 feet above water. The rear beacon consists of four piles 40 feet long, one center and three outside piles, the latter driven in a triangle of 5 feet centers in about 8 feet of water. The focal plane is 38 feet above water.

154, 156. *Lower Middle and Upper (E. side) beacons, Lake St. Clair Twenty-foot Channel, Michigan.*—Two additional pile clusters for lighting the southeasterly side and to mark the lower reach of this channel were reestablished, and the stations were first lighted July 21, 1898. Each cluster consisted of three piles, driven in 14½ feet and 16½ feet of water, respectively, and were surmounted with a wooden platform and box,

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with upright. The lights were 15 feet above lake level. An iron ladder was provided for each beacon. The upper beacon was carried away on November 16, 1898, by some unknown vessel, and was reestablished on November 23, 1898.

153–156. Lake St. Clair Twenty-foot Channel, Michigan.—The act approved July 1, 1898, provided $20,000 for a light and fog-signal station to mark the new Twenty-foot Channel. With this amount four Pintsch gaslights were placed along this channel, two on each side. The distance between the lights is about 8,000 feet. They are supported by 4½-inch iron pipes, resting upon timber cribs 26 feet square filled with stone. They rest upon a foundation of stone which was thrown in until the top surface came to about 13 feet below the surface of the water. There is a berm of 4 feet around the outside of the crib. Each crib is surmounted by a frustrum of a pyramid 8 feet high. In this pyramidal portion are placed two wrought-iron cylinders, each 50 inches in diameter by 8¼ feet long, having a capacity of 100 cubic feet. When these are filled with Pintsch gas at a pressure of 12 atmospheres the quantity is sufficient to keep the light burning for two thousand four hundred hours, or about three months, the consumption being at the rate of a cubic foot an hour. The lights are white flash for five seconds, with an eclipse of fifteen seconds, and are 25 feet above the water surface. The lights were first exhibited on the night of June 13, 1899.

158, 159. St. Clair Flats range, Lake St. Clair, Michigan.—The material for repairing the keeper's dwelling, rebuilding the boathouses and repointing and cement-washing the exterior of the tower and dwelling of the rear range was delivered at the station by the tender *Amaranth*. The front beacon of the range was also repointed and cement-washed. Material for rebuilding the superstructure of the foundation crib was delivered near the station by the tender *Amaranth*. The work was completed in June, the entire superstructure having been rebuilt from the first course of timber above the water line. The entire deck planking was also renewed. Ten of the iron protection plates, which had been taken off and straightened, were replaced. The two boathouses were entirely rebuilt, a movable boat landing with steps was placed on each side of the crib, and the fence on top of the crib was rebuilt. The boat crane was moved from the front crib and erected on the rear crib. All new work was painted. Various repairs were made.

161. St. Clair Flats Canal (upper), Lake St. Clair, Michigan.—A set of fourth-order deflectors for the new fourth-order lamp was sent to the keeper.

162–173. St. Clair River lights, Michigan.—The walks leading to lights Middle No. 2, Upper No. 3, Middle No. 8, and Middle No. 11 were rebuilt, and the walks at Lower No. 1, Lower No. 4, and Upper No. 6 were repaired. The corners of the foundation crib at Upper No. 12 were protected with steel plates. Minor repairs were made.

175, 176. Fort Gratiot range, St. Clair River, Michigan.—On November 11, 1898, the rear range tower was blown down during a severe storm and completely wrecked, the tower being broken off about 10 feet from the ground. Temporary repairs were made and the range lights were continued for the balance of that season and until the permanent towers were erected. The reestablishment of the range on the property of the Grand Trunk Railway Company was accomplished, and the range was lighted on April 25, 1899. The rear tower is a square, white, pyramidal iron structure, 69 feet to the focal plane, surmounted by an elliptical white day mark, and is erected on brick foundation piers. A small wooden lamp and cleaning house was placed at the base of the tower. The pole for the front range was erected, and lantern guides were provided for each light.

184. Pointe aux Barques, Lake Huron, Michigan.—Fog-signal apparatus was contracted for, and is reported to be completed and ready for inspection.

185. Port Austin Reef, Lake Huron, Michigan.—A contract for two sets of fog-signal apparatus, consisting of boilers with engines, etc., was made. A contract for furnishing the material for rebuilding the tower and reconstructing the fog signal houses into one building is being made. This material is being collected at the light-house depot at Detroit preparatory to shipping it to the station on the tender *Amaranth.*

189. Tawas, Lake Huron, Michigan.—The illuminating apparatus was overhauled and repaired at the district lamp shop. Material for a fog-signal building was delivered at the light-house depot at Detroit, from whence it was conveyed to the light-station by the tender *Amaranth.* The erection of the structure was commenced in June, 1899. Trenches for the foundation had been dug, grillage and footings for the west side of the building had been put in, mortar beds made, and a well for water supply for these had been driven. Contract was made for the fog-signal apparatus, and the apparatus was conveyed to the station by the tender *Amaranth.* It is proposed to place one set of these boilers and engines, which were constructed and delivered at the Detroit depot on April 24, 1899, in accordance with the terms of the contract entered into, in commission at this station.

193. Thunder Bay Island, Lake Huron, Michigan.—The boiler of fog-signal No. 2 was replaced. A new exhaust pipe with a safety valve was provided, and the whistle was removed about 3 feet from the smokestack. A new cement floor was laid in the fog-signal building No. 1, a brick pier was built under the rear end of the boiler, and four piers were built under the water tank. Various repairs were made.

——. *Middle Island, Lake Huron, Michigan.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> A light and fog-signal are now needed here, both in order to make available the harbor of refuge behind Middle Island, the only one in the vicinity having sufficient depth of water for the modern deep-draft lake vessels, and to mark a turning point in the regular course of vessels bound up or down the coast. It is proposed to establish a light and fog-signal station on Middle Island. This it is estimated can be done for $25,000, and it is recommended that an appropriation of this amount be made therefor.

194, 195. Presque Isle Harbor range, Lake Huron, Michigan.—The sills, joists, and floor of the porch of the dwelling were renewed, and 500 feet of walk between the ranges was relaid. Minor repairs were made.

198. Spectacle Reef, Lake Huron, Michigan.—The ice, which piled up on the crib surrounding this tower, damaged the stairway leading from the crib into the tower and other light structures on the crib. The stone from one pocket of the crib and about one-half from another disappeared, as the back wash of the waves scoured the sand from beneath the edge of the crib at three points, allowing the stone to drop down and be washed away. The damage will be repaired during the present summer. Minor repairs were made.

203. Cheboygan, Straits of Mackinac, Michigan.—The sand that had drifted from the foundation of the kitchen was replaced and a retaining wall of logs was built to hold it in place. A new smokestack was placed in position on each of the fog-signal boilers. Material for a brick smokestack to replace the iron stacks was purchased and delivered at the Detroit depot, from whence it was conveyed to the station by the tender *Amaranth.* Minor repairs were made.

204. Cheboygan crib, Straits of Mackinac, Michigan.—The foundation crib was riprapped with 28 cords of stone, and 2 cords of stone filling was placed in the crib. The timberwork was leveled and the deck was relaid.

205, 206. Cheboygan River range, Straits of Mackinac, Michigan.—The bulkhead, which had bulged out, was repaired and straightened. To hold it in place posts were driven 10 feet back of the bulkhead, cedar poles were placed behind them and bolted to the bulkhead by tie rods. The act approved July 1, 1898, provided $1,750 for the purchase of additional land for the front range. The question of its ownership is now pending in court.

212, 213. Pilot Island range, St. Marys River, Michigan.—An extension was added to the existing dwelling, forming a bedroom and a living room. Various repairs were made.

215. Mud Lake, St. Marys River, Michigan.—The act approved July 1, 1898, provided $3,500 for establishing a light to mark the turning point in the channel through Mud Lake, St. Marys River, Michigan. It was determined to do this with a Pintsch gas light supported upon a crib. The work is well advanced. The crib will be 26 feet square, filled with stone. It will be in 20 feet of water, and rest upon a foundation of stone thrown in until the top surface is about 14 feet below the surface of the water. There will be a berm of 4 feet around the outside edge of the crib. The crib will be surmounted by a frustrum of a pyramid 8 feet high. In this portion there will be placed two wrought-iron cylinders each 50 inches in diameter and 8½ feet long, having a capacity of 100 cubic feet. When these are filled with Pintsch gas at a pressure of 12 atmospheres the quantity is sufficient to keep the light burning for 2,400 hours, or about three months, the consumption being at the rate of 1 cubic foot per hour. The light will be exhibited from the top of a 4½-inch iron pipe and will be 25 feet above the surface of the water. The material for the crib was purchased and the work is being done by hired labor. Some 128 cords of stone was placed on the side. The crib is framed and is ready to be settled on the foundation.

225, 226. Harwood Point range, St. Marys River, Michigan.—A new frame for the day mark was provided.

236, 237. Lower Hay Lake cut range, Nos. 10 and 11, Hay Lake Channel, St. Marys River, Michigan.—The site was inclosed with 2,430 feet of wire fence with gates. The old camp buildings were made into a barn and woodshed. Various repairs were made.

240. Lower Hay Lake cut, west side north entrance, No. 15, Hay Lake Channel, St. Marys River, Michigan.—The four corner plates of the foundation crib were raised 2 feet on account of the sinking of the crib.

247, 248. Six-mile Point range, Hay Lake Channel, Michigan.—An oil house was built and a landing dock 310 feet long was built out to where the water was 6 feet deep.

253. North entrance, No. 27, Hay Lake Channel, Michigan.—A fireproof brick oil house was built. Various repairs were made.

256, 257. Vidal Shoal Channel range, St. Marys River, Michigan.—The north and south pier lights at their new positions near the railroad embankment and the outer end of the north pier were practically rebuilt. The front beacon was moved to the end of the north pier and placed on temporary foundation. Three wooded cribs 10 feet square and 7 feet deep were placed at the southerly end of the International Railroad Bridge and filled with ballast, and the rear beacon was placed upon these. The upper portion of the cribs, upon which the rear beacon rests, are yet to be filled with concrete.

258. St. Marys Falls Canal, South Pier, Michigan.—A small wooden structure with open stairway and iron hand railing was framed and erected on this pier. The sides and ends of the building were painted white and the roof red.

266, 267. Head of St. Marys River range, Michigan.—Pending negotiations for title for the sites of these range lights, it was learned that by reason of hidden obstructions on the course which they are to mark out it might be necessary to change the course somewhat, and in consequence the position of the lights. Until the maps are prepared which will determine this negotiations for the land are suspended.

—. *Crisps Point, Lake Superior, Michigan.*—The following recommendation made in the Board's last three annual reports is renewed:

> This is a dangerous point for vessels bound down the lake in thick weather. These vessels all try to make Whitefish Point, but a slight variation in their course from the nearest point of departure will run them ashore near Crisps Point. Several wrecks have occurred here. It is proposed to establish a light and fog-signal station on or near Crisps Point. This it is estimated can be done for $18,000, and it is recommended that an appropriation of this amount be made therefor.

295. Point Iroquois, Lake Superior, Michigan.—A walk 4 feet wide was laid on four sides of the signal house and one 2 feet wide from the signal house to the dock, a distance of 104 feet. Various repairs were made.

298. Grand Marais Harbor of Refuge rear range, Lake Superior, Michigan.—The construction of the rear beacon, including the erection of the lens, was completed and the light was exhibited on July 18, 1899.

299. Big Sable, Lake Superior, Michigan.—A hoisting engine was installed, 55 feet of track were laid from the signal house to connect with existing track, the turntable was completed, and the work in connection with the hoisting engine was finished. Various repairs were made.

301. Grand Island Harbor, Lake Superior, Michigan.—A crib 8 feet by 24 feet in plan was built in front of the light-house, the intervening space was filled in to grade line, and a crib was built 45 feet to the westward of the house and connected to the shore by a smaller crib, and 12 cords of stone were placed in the cribs. The beach is making slowly between the shore and the cribs. The boat landing was extended to the shore, the crib was leveled, and the leaks in the tower repaired. A crib was placed to the eastward of the tower and dwelling for additional protection to the site. About 100 running feet of beach protection, consisting of brush and stone, was placed to the eastward of the building for further protection to the site. The boat landing was rebuilt, a small crib for holding boatways in place was sunk in position, and 311 feet of beach protection, consisting of brush and stone, was placed to the eastward of the building for further protection to the site. Various repairs were made.

305. Marquette Breakwater, Lake Superior, Michigan.—The drop for the weights of the gasoline machine was changed to 9½ feet, and the apparatus, supplied with the best quality of gasoline, will run for eight days. On account of the difficulty of access to this light during the stormy seasons, it was deemed advisable to try the experiment of using electricity, keeping the gasoline outfit on hand to be used in case of emergency. Electric wires were therefore connected with the Marquette electric supply and were extended to the light at the end of the pier. There are 930 feet of this fastened to the walls of the gallery or subway of the concrete superstructure of the pier and 1,897 feet fastened to the harbor side of the substructure 2 feet below water level. This is protected from ice by an oak board, with grooves for the wires, spiked over it to the crib timbers. When the concrete superstructure is finished to the end of the pier it is proposed to put the wires now fastened to the crib in the gallery, the same as is done with the 930 feet. The work of establishing these wires was practically completed at the end of the year. Early in July the electrical connection will be made.

307. Big Bay Point, Lake Superior, Michigan.—The work of installing a hoisting engine and constructing a wharf landing was completed as far as practicable. The hoisting engine was tested. A tramway leading from landing pier to the top of the bank and from thence to the junction with the old track leading to the boat landing in the bay, was built and 210 running feet of iron track laid thereon. The building of a crib for an additional landing wharf was completed and ready for launching. Various repairs were made.

308. Huron Island, Lake Superior, Michigan.—The reconstruction of the fog-signal houses was completed. The hoisting engine was set up. Some 167 feet of tramway were rebuilt. The old fog signal No. 1 was dismantled and carried to the pier, ready for return to the Detroit light-house depot. The boilers and engines were set up, a tank was made, a steam and water connection inside of building were made. The stairway at the bluff leading to the light-house was rebuilt, and the tramway, turntable, and connections finished. Various repairs were made.

309. Stannard Rock, Lake Superior, Michigan.—The northern boiler was dismantled and returned to the Detroit light-house depot, and it was replaced by a repaired boiler. The defective upright boiler was returned to the light-house depot and repaired. Various repairs were made.

314. Light No. 0, Portage River and Lake, Michigan.—Two cords of riprap were placed around the foundation.

338. Manitou, Lake Superior, Michigan.—A crib was partially sunk in the south cove and ballast rock was blasted out to make a place for the boathouse and boatways. In October, 1898, the crib was carried out of position by a violent gale and almost destroyed. The crib has been completed, with the exception of three top courses, and filled with about 20 cords of stone. The working party succeeded in saving much of the timber of the upper courses, which was stored for the continuation of the work next season. On account of the lateness of the season it was deemed best to postpone further work until a more suitable season. At the end of the fiscal year this work had not been resumed. Various repairs were made.

339. Gull Rock, Lake Superior, Michigan.—A protection crib for boathouse and also boatways were constructed. Repairs were made.

346. Eagle River, Lake Superior, Michigan.—The moving of this light to Sand Hills, at a cost not to exceed $20,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. Recommendation is made that the amount named be appropriated.

357. Devils Island, Lake Superior, Wisconsin.—The construction, delivery, and erection of this light tower by contract were completed on October 17, 1898. The hoisting engine was repaired and 160 feet of steel hoisting rope was provided.

361-376. Superior and St. Louis bays, Wisconsin and Minnesota.—The thirteen pile clusters that were carried away by ice were replaced.

364. Superior Bay Channel (lower) post light, Minnesota.—This cluster, which had been somewhat damaged by an unknown vessel on October 22, 1898, was straightened and the wooden platform and box were replaced.

368, 369. Connors Point range, Superior Bay, Minnesota.—A pile cluster was replaced.

372-375. East and west ranges, North Channel, St. Louis Bay, Minnesota.—The color of the lights was changed from white to red about September 10, 1898.

374. West range, North Channel (front), Minnesota.—This cluster was carried away on the night of October 13, 1898, by some unknown vessel, and was replaced the next day.

377, 378. Duluth range, Lake Superior, Minnesota.—Drawings of a combined light tower and fog-signal building, to be erected on the pierhead of the new concrete superstructure, were made. Additional drawings in detail will be ready when the superstructure of the pier is finished.

—. *Rock of Ages, Lake Superior, Michigan.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> During the season of southerly and westerly winds many vessels bound to and from Duluth, by taking a course along the north shore of the lake and in lee of Isle Royale, are enabled to run when the lake is too rough for the more southerly course. A light and fog-signal on the dangerous rocks off the westerly end of Isle Royale would be a valuable aid to these vessels. It is therefore proposed to establish a light and fog-signal station on the Rock of Ages, off the western end of Isle Royale. This, it is estimated, can be done for $50,000, and it is recommended that an appropriation of that amount be made therefor.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

177. Fort Gratiot, Mich.
179. Port Sanilac, Mich.
180. Sand Beach, Mich.
186, 187. Saginaw River range, Mich.
188. Charity Island, Mich.
190. Au Sable pierhead, Mich.
192. Alpena, Mich.
196. Presque Isle, Mich.
207. Round Island, Mich.
262, 263. St. Marys River range (lower), Mich.
279. Upper Lake George, Mich.
286. Payment range, Mich.
296. Whitefish Point, Mich.
300. Grand Island, Mich.
304. Marquette, Mich.
306. Granite Island, Mich.
310. Sand Point, Mich.
312, 313. Portage range, Mich.
343. Eagle Harbor, Mich.
344, 345. Eagle Harbor range, Mich.
347. Portage Lake Ship Canals, Mich.
348. Portage Lake Ship Canals pierhead, Mich.
349. Fourteen-mile Point, Mich.
350. Ontonagon, Mich.
352. Outer Island, Wis.
353. Michigan Island, Wis.
354. La Pointe, Wis.
355. Chequamegon Point, Wis.
356. Raspberry Island, Wis.
358. Sand Island, Wis.
359. Superior pierhead range, Wis.
379. Two Harbors, Minn.
381. Grand Marais, Minn.
382. Isle Royale, Mich.

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LIGHT-VESSELS.

157. Grossepoint light-vessel, No. 10, Lake St. Clair, Michigan.—This wooden light-vessel was built in 1878 and is of about 170 tons burden. She is old and not worth repair. Her position was changed in the spring of 1899 to the northeast (or upper) end of the 20-foot channel, Lake St. Clair, Michigan, a more exposed place than she occupied last year. She was removed from her station at the close of navigation, December 13, 1898, and was replaced April 18, 1899. Slight repairs were made.

178. Lake Huron light-vessel, No. 61, Lake Huron, Michigan.—This wooden light-vessel was built in 1893, is of about 101 tons burden, and has a steam fog-signal. She was docked, repaired, and recalked. She was removed from her station at the close of navigation, December 15, 1898, and was replaced on April 18, 1899.

—. *Martins Reef light-vessel, northwestern end of Lake Huron, Michigan.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> It is proposed to place a light on Martins Reef as an aid to the great and increasing traffic between the mouth of the St. Marys River and the Straits of Mackinac. Since the great development of steel works at Chicago, Milwaukee, and Joliet and the discovery of new and cheap ores suitable for making steel on the northerly shores of Lake Superior the commerce passing from the mouth of the St. Marys River through the Straits of Mackinac into Lake Michigan has increased with rapidity. It is several times greater than it was five years ago. The vessels carrying ore from Duluth and Two Harbors to Lake Michigan ports are the largest in the lake-marine class. These vessels pass close to the dangerous Martins Reef, hence a light-vessel there is much needed. It is estimated that a proper light-vessel can be built and placed there for $15,000, and it is recommended that an appropriation of this amount be made therefor.

201. Poe Reef light-vessel, No. 62, entrance to South Channel, Straits of Mackinac, Michigan.—This wooden light-vessel was built in 1893, is of about 101 tons burden, and has a steam fog-signal. She was removed from her station at the close of navigation, December 14, 1898, and was replaced at the opening of navigation, April 27, 1899. Various and minor repairs were made.

FOG-SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

177. Fort Gratiot, Michigan.—This 8-inch steam whistle was in operation some 79 hours and consumed about 10 tons of coal.

178. Lake Huron light-vessel, No. 61, Michigan.—This 6-inch steam whistle was in operation some 108 hours and consumed about 6 tons of coal.

180. Sand Beach, harbor of refuge, north main light, Michigan.—This 10-inch steam whistle was in operation some 103 hours and consumed about 13 tons of coal.

185. Port Austin Reef, Michigan.—This 10-inch steam whistle was in operation some 95 hours and consumed about 9 tons of coal.

193. Thunder Bay Island, Michigan.—This 10-inch steam whistle was in operation some 181 hours and consumed about 13 tons of coal.

196. Presque Isle, Michigan.—This 10-inch steam whistle was in operation some 274 hours and consumed about 18 tons of coal.

197. Forty-mile Point, Michigan.—This 10-inch steam whistle was in operation some 117 hours and consumed about 4 tons of coal.

198. Spectacle Reef, Michigan.—This 10-inch steam whistle was in operation some 256 hours and consumed about 15 tons of coal.

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200. Detour, Michigan.—This 10-inch steam whistle was in operation some 164 hours and consumed about 17 tons of coal.

201. Poe Reef light-vessel, No. 62, Michigan.—This 6-inch steam whistle was in operation some 182 hours and consumed about 18 tons of coal.

203. Cheboygan, Michigan.—This 10-inch steam whistle was in operation some 194 hours and consumed about 24 tons of coal.

207. Round Island, Straits of Mackinac, Michigan.—This 10-inch steam whistle was in operation some 167 hours, and consumed about 9 tons of coal.

295. Point Iroquois, Michigan.—This 10-inch steam whistle was in operation some 298 hours, and consumed about 21 tons of coal.

296. Whitefish Point, Michigan.—This 10-inch steam whistle was in operation some 455 hours, and consumed about 27 tons of coal.

299. Big Sable, Michigan.—This 10 inch steam whistle was in operation some 164 hours, and consumed about 15 tons of coal.

304. Marquette, Michigan.—This 10 inch steam whistle was in operation some 346 hours, and consumed about 22 tons of coal.

307. Big Bay Point, Michigan.—This 10-inch steam whistle was in operation some 284 hours, and consumed about 6 tons of coal.

308. Huron Island, Michigan.—This 10-inch steam whistle was in operation some 300 hours, and consumed about 20 tons of coal.

309. Stannard Rock, Michigan.—This 10-inch steam whistle was in operation some 271 hours, and consumed about 13 tons of coal.

338. Manitou, Michigan.—This 10-inch steam whistle was in operation some 506 hours, and consumed about 26 tons of coal.

343. Eagle Harbor, Michigan.—This 10-inch steam whistle was in operation some 438 hours, and consumed about 38 tons of coal.

348. Portage Lake Ship Canals Pierhead, Michigan.—This 10-inch team whistle was in operation some 451 hours, and consumed about 27 sons of coal.

349. Fourteen-mile Point, Michigan.—This 10-inch steam whistle was in operation some 137 hours, and consumed about 6 tons of coal.

352. Outer Island, Wisconsin.—This 10-inch steam whistle was in operation some 416 hours, and consumed about 26 tons of coal.

354. La Pointe, Wisconsin.—This 10-inch steam whistle was in operation some 242 hours, and consumed about 12 tons of coal.

357. Devils Island, Wisconsin.—This 10-inch steam whistle was in operation some 256 hours, and consumed about 9 tons of coal.

359. Superior Pierhead (front), Wisconsin.—This 6-inch steam whistle was in operation some 488 hours, and consumed about 30 tons of coal.

377. Duluth Range (front), Minnesota.—This 10-inch steam whistle was in operation some 655 hours, and consumed about 32 tons of coal.

379. Two Harbors, Minnesota.—This 10-inch steam whistle was in operation some 546 hours, and consumed about 19 tons of coal.

383. Passage Island, Michigan.—This 10-inch steam whistle was in operation some 518 hours, and consumed about 28 tons of coal.

DAY OR UNLIGHTED BEACONS.

Stannard Rock Beacon. In good condition.

BUOYAGE.

The buoys marking the channels in the Detroit River and Lake and River St. Clair were cared for by the tender *Marigold.* Some trouble was

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experienced in keeping the buoy at the head of Russell Island in position. Six buoys were lost from that point. The iron buoys in Lake Huron and the Straits of Mackinac, cared for by the tender *Marigold*, remained in their positions. The buoys marking the entrance to Saginaw River are cared for by contract. The buoys of St. Marys River are cared for by contract, except the gas buoys, which are looked after by the tender *Marigold*. The buoys in Portage Lake and River are cared for by contract. The buoys marking the channels in Superior and St. Louis bays were cared for by contract the past year. The buoys marking the dangers to navigation off Pointe Abbaye, Lake Superior, were placed and cared for by the tender *Marigold*, and were removed by contract.

DEPOTS.

Detroit, Michigan.—The work of renewing the bulkhead and well at rear of the wharf under contract was completed July 8, 1898. About 110 running feet was constructed. The hydrant was replaced. Defective timbers and planking in the depot wharf were replaced. The west wall of the depot grounds was repaired. Repairs were made to the plastering under the slate roof, supported in part by the wall; stone coping was repointed, and the gutter of the structure repaired and painted. The entire wall was cement washed. The stone foundation and steps of the main storehouse were repointed.

Depot for the Eleventh light-house district, Lakes Superior, Huron, and St. Clair.—By the act approved July 1, 1898, an appropriation of $15,000 was made for establishing a light-house and buoy depot in the vicinity of Sault Ste Marie, Mich. Investigations are being made as to the most suitable location where the necessary buildings and conveniences can be built at a cost not exceeding the amount appropriated. These investigations have not been fully completed.

District lamp shop.—Many of the repairs to the burners, illuminating apparatus, etc., mentioned in the foregoing paragraphs, were made by the district lampist at the district lamp shop.

TENDERS.

Marigold.—This iron screw steamer was built in 1890, and is of about 450 tons burden. She was employed during the past year in inspecting lights and delivering supplies and fuel to the stations and fog signals, during which time she steamed some 10,715 miles and consumed about 706 tons of coal. At the opening of navigation the *Marigold* was placed in the dry dock, painted, and her stern bearings and outboard underwater valves were overhauled. Alterations and additions were made to the chart room on upper deck. A larger ice box was built on starboard side of main deck and a wash and bath room fitted for use of the crew.

Amaranth.—This steel screw steamer was built in 1892, and is of 744 tons burden. Repairs were made to the decks, bath tubs, heating apparatus, etc., and the interior woodwork of the cabins and pilot house. She visited all the stations in the Eleventh district and many in the Ninth district, delivering material for construction or repairs. On the establishment of an office for the engineer of the Ninth district at Milwaukee she conveyed the district records and property to that place. She placed four cribs on their sites on the Twenty-foot

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Channel in Lake St. Clair, and transported stone for their foundations and for filling them; also the stone for the foundation of Mud Lake light-station. The tender was in winter quarters at Detroit. The *Amaranth* delivered at light-stations in the two districts about 5,108 tons of material. In doing this she steamed some 13,016 miles and consumed some 982 tons of bituminous coal. About 125 tons of coal were consumed while in winter quarters.

The launch of the Amaranth.—The hull, boiler, and engine were put in good repair. She was employed in connection with the establishment and repairs to range lights and cribs, and for towing lighters from the tender *Amaranth* to and from shore, delivering material.

The launch Lotus.—Has been laid up at the Detroit depot during the year; unfit for service.

SCOW LIGHTER.

The tow chock was renewed, some defective deck planking replaced with new planks, and the entire hull was calked and painted.

TWELFTH DISTRICT.

This district extends from the boundary between California and Mexico to the boundary between California and Oregon. It embraces all aids to navigation on the seacoast, bays, rivers, and other tidal waters of California.

Inspector.—Maj. C. E. L. B. Davis, Corps of Engineers, United States Army, to July 5, 1898; Capt. George W. Coffin, United States Navy, to November 1, 1898; Maj. C. E. L. B. Davis, Corps of Engineers, United States Army, to November 10, 1898; since then Commander Uriel Sebree, United States Navy.

Engineer.—Maj. C. E. L. B. Davis, Corps of Engineers, United States Army.

There are in this district—

Light-houses and lighted beacons, including 3 post lights	45
Light-vessel in position	1
Day or unlighted beacons	55
Lighted beacons used also as day marks	16
Fog-signals operated by steam	16
Fog-signals operated by clockwork	8
Fog-signal operated by hand	1
Whistling buoys in position	14
Bell buoys in position	11
Other buoys in position	69
Steamer *Madroño*, buoy tender, and for supply and inspection	1
Steam launch of *Madroño*	1
Steam launch *Hazel*, for construction and repairs	1

NOTE.—The number preceding the name of a light-station in the Twelfth and Thirteenth districts is that by which it is designated in the List of Lights and Fog-Signals on the Pacific Coast of the United States, corrected to February 1, 1899.

LIGHT-STATIONS.

1. *Point Loma, entrance to San Diego Bay, California.*—The iron door of the skeleton tower was repaired, and new fences were built across the reservation and around the cement watershed. Two small storehouses were built in the rear of the dwellings for the storage of fuel and paint. The roadway was repaired where required. Minor repairs were made.

2. *Ballast Point, San Diego Bay, California.*—A picket fence 300 feet long was built, dividing the light-house grounds from the balance of the military reservation.

2, 3, 4, 5, 6, San Diego Bay, California.—Ballast Point, Beacon No. 2, La Playa, Beacon No. 6, and Diamond Beacon were discontinued May 25, 1898, on account of placing submarine mines in the harbor, and were relighted July 18, 1898. A small platform was built around the top of Beacon No. 2 to enable the keeper to reach all sides of the lens lantern.

—. *Quarantine Wharf fog-signal, San Diego Bay, California.*—A small bell struck by machinery will be placed on the end of the wharf at the quarantine station as soon as funds are available.

8. *Point Hueneme, entrance to Santa Barbara Channel, California.*—The occulting apparatus was taken out and a lens with flashing white characteristics substituted. Minor repairs were made. The act

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ved March 3, 1899, appropriated $2,000 for a right of way to this n from the town of Hueneme. Steps have been taken so that the required may be purchased as soon as possible.

Santa Barbara, Pacific Ocean, near Santa Barbara Landing, Cali- a.—Minor repairs were made. The following recommendation, ɜ in the Board's last two annual reports, is renewed:

> › light-house at this station was built in 1856. It is of brick with the outer stuccoed. The light is shown from an old-fashioned lantern with triangular- ɜd glass, built on top of the dwelling. The structure is unsightly and uncom- ble, and in winter the walls are damp. To put this building in good repair .d cost as much, if not more, than to build a new modern structure. This can one, it is estimated, for not exceeding $7,500, and it is recommended that an ·opriation of that amount be made therefor.

–. *Point Arguello, about 12 miles northwest of Point Conception, sea- st of California.*—The act approved March 3, 1899, appropriated ,000 for establishing a light-house and fog-signal on this point, ere there is a light house reservation of about 50 acres. Plans for buildings are now being prepared.

1. *San Luis Obispo, seacoast of California.*—The old wharf was aired, the foundation piles being inclosed in concrete forms to pre- t their further destruction by marine insects. Various repairs were de.

–. *Point Buchon, about 8 miles northwest from Point San Luis Obispo, lifornia.*—The recommendation, made in the Board's last two annual orts and several previous ones, is renewed that an appropriation be de to establish a light and fog-signal at this point, at an estimated t of $33,000.

> his point is in San Luis Obispo County, and is 17 miles distant from the town of . Luis Obispo by wagon road and trail. The nearest light house is Piedras ncas, about 30 nautical miles to the northward and westward. The point is minent, and with its outlying rocks is very dangerous to navigators close ɔore during a fog, especially as vessels going to and from Port Hartford make a rp turn just off this point.

13. *Point Sur, seacoast of California.*—A bridge was built spanning anyon on the roadway. It consists of three spans, aggregating 80 t in length. It is built of timber with iron truss rods. The sup- rts on both sides are set in concrete and are protected by wooden lkheads. The approaches were graded to shed the rain water and ɜvent erosion. A trail was graded around the hill from its base to ɜ top to provide an easier passage than that afforded by the long ;ht of steps. Various repairs were made. The following recom- ndation, made in the Board's last three annual reports, is renewed:

> 'he accommodation for the four keepers at this station is insufficient, and it is ommended that an appropriation of $6,000 be made to build a new cottage.

14. *Point Pinos, entrance to Monterey Bay, California.*—Minor repairs re made. The following recommendation, which was made in the ard's annual report for the last ten years, is renewed:

> 'he plat of land owned by the Government at this station does not touch the sea any point on its boundary line. For convenience in landing stores and supplies s essential that the United States should own the strip of land between the light- ıse lot and the seacoast. The owners have offered to sell the land desired for 000, and the Board recommends that an appropriation be made for its purchase.

16. *Año Nuevo Island, on the seaward side of Año Nuevo Island, Cali- nia.*—The old fog-signal building was torn down and a new frame ilding was erected in front of the old site. The fog-signal apparatus

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was moved into it and put in good condition. New 4-inch whistle valves were substituted for the small valves formerly in use. The new building will be completed during the next fiscal year. Minor repairs were made.

17. Pigeon Point, extreme end of Pigeon Point, seacoast of California.—The fog-signal building was torn down and the construction of a new building was commenced in September; the work was nearly finished in December, when it was stopped by lack of funds. The apparatus was put in efficient condition. A new smokestack was put up, and new 4-inch whistle valves substituted for the old-style small valves. The signal house will be finished early in the next fiscal year.

The following recommendation, made in the Board's last five annual reports, is renewed:

> There are standing, outside of the light-house site, but close to the fence inclosing the light-house structures, a fisherman's shanty and a hay barn. If a fire should break out in either of these buildings it would endanger the structures of the light-station. It is proposed, in order to obviate this danger, that an additional strip of land to the eastward of the station, say 150 feet wide, be purchased and added to the light-house reservation. This, it is estimated, can be done for not exceeding $5,000, and it is recommended that an appropriation of this amount be made therefor.

18. Point Montara, above Pillar Point, seacoast of California.—A new fog-signal boiler was erected. The fog-signal building is old, small and in poor condition. Minor repairs were made.

21. Bonita Point, entrance to San Francisco Bay, California.—The windmill and pump supply were found inadequate. A new aermotor mill, with ball-valve cylinder, was purchased and set up at the spring, and both work satisfactorily. The mill was damaged during a gale, so several broken castings were replaced. Fences were built around the keepers' dwellings. A telephone system was installed to supplant the electric call bells, consisting of six magneto-bell telephones, one placed in the quarters of each of the keepers, the tower, and the fog signal.

This double frame building is old and in bad order. It would cost nearly as much to put it in proper condition as it would to erect a new dwelling, owing to its faulty site and poor foundation. It is estimated that a new double dwelling can be erected for not exceeding $6,000. The Board therefore recommends that an appropriation of this amount be made therefor.

—. *Fort Winfield Scott, Fort Point, California.*—The present Fort Point fog-signal, a bell struck by machinery, has long been complained of as inadequate, both in position and power. It is proposed to replace it with a second-class Daboll trumpet, blown by compressed air, and to place it on the top of the northwest bastion of Fort Winfield Scott, Fort Point, California, which will bring it directly over the present location of the bell. It is estimated that this can be done for not exceeding $7,000, and it is recommended that an appropriation of this amount be made therefor.

—. *Quarry Point, Angel Island, San Francisco Bay, California.*—The following recommendation, made in the Board's last seven annual reports, is renewed:

> Various petitions have been received from those representing marine interests asking that a fog-signal be established at this point. The passage between the eastern side of Angel Island and Southampton Shoal is quite narrow. The strong tides setting in and out through the Golden Gate have full force on a vessel bound up or down the bay, and in the case of ships being towed, as so many are, past this point, the set of the current is enough to make it hazardous, there being danger either of running aground on Southampton Shoal or Angel Island. An enormous quantity of shipping annually passes this point, bound to or from the great grain wharves at

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Port Costa, the Sacramento and San Joaquin rivers, and Mare Island Strait. Hundreds of the largest sailing ships are towed from San Francisco to Port Costa, where they load with grain and are then towed down and out to sea. In this way there is more shipping passing through these waters than anywhere else in the district, except through the Golden Gate. There have been a number of casualties in the vicinity of this point.

Among many were the following:

The ferry steamer *Contra Costa*, plying between San Francisco and San Quentin with passengers, ran ashore near California City.

The ship *E. B. Sutton*, while being towed down from Port Costa, ran ashore near Quarry Point, Angel Island.

The ship *Eleanor Margaret*, bound to Port Costa, ran ashore on Bluff Point, Raccoon Straits.

The ship *Maulsden*, while being towed to Port Costa, ran ashore on Southampton Shoal.

Mariners have asked that Quarry Point be selected for the fog-signal station, because, to make a start upriver in a fog, it is necessary to make Angel Island to get a departure. After careful examination, the Board reached the conclusion that a fog-signal at this locality would be a decided aid to mariners. In view of the great economy of establishing and maintaining a large fog bell here instead of a steam fog-signal, it decided in favor of the former. It is estimated that it will cost $6,000 to establish this fog bell, and it is recommended that an appropriation of this amount be made therefor.

25. *Alcatraz Island, San Francisco Bay, California.*—A brick oil house, with metal roof, was built. A wire rope was provided for the bell machinery.

27. *Oakland Harbor, entrance to San Antonio Creek, Oakland Harbor, California.*—An inclosed platform was built under the new portion of the dwelling to provide storage room. The piles supporting the old portion of the dwelling, which were nearly destroyed by *limnoria* and *teredo navalis*, were protected and strengthened by encasing them with concrete in wooden forms 3 feet in diameter by 6 feet high, thus placing a covering a foot thick over the damaged portion of the piles.

32. *Mare Island, entrance to Karquinez Straits, California.*—The pipe line was slightly altered to prevent impure water from the navy yard reservoir from entering the light-house supply. Two eucalyptus trees were removed to prevent their roots from injuring the masonry of the cistern.

—. *New York Slough, entrance to San Joaquin River, California.*—The following recommendation, made in previous annual reports, is renewed:

> The establishment of a light and fog signal here, at a cost not exceeding $10,000, was authorized by the act approved February 15, 1893, but no appropriation therefor has yet been made. The Board recommends that the amount named be appropriated.

38. *Point Arena, Pacific Ocean, California.*—The act approved July 1, 1898, made an appropriation for a telephone line to connect this station with the town of Point Arena. This line was established in November, 1898, and consists of a return circuit of hard drawn copper wire strung on redwood poles placed 150 feet apart. The terminal at the station is in the keeper's quarters; that at the town of Point Arena is placed in one of the hotels, where the office of the general telephone system of the coast is located. The proprietor of the hotel is the agent of the telephone company, and arrangements have been made with him to transmit any message of importance to or from the light-station.

39. *Cape Mendocino, seacoast of California.*—The following recommendation, made in the Board's last three annual reports, is renewed:

> The plans approved by the Board contemplated the construction of an additional cottage for the assistant keeper. It is estimated that a proper structure can be erected for $5,500, and it is recommended that an appropriation of that amount be made therefor.

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There is no oil house here and the supply of mineral oil is kept in the tower used for the apparatus. In case of fire the entire tower and apparatus would in all probability be destroyed. Owing to the isolation of this station it is impossible to build a brick oil house for $550, the amount hitherto allowed by Congress. It is estimated that a suitable fireproof oil house can be built for $1,000, and the Board recommends that an appropriation of this amount be made therefor.

40. Humboldt, on Table Bluff, entrance to Humboldt Bay, California.—A brick foundation was built under the 50,000-gallon water tank. Various repairs were made.

—. *Humboldt (old station).*—The buildings at the old light-station, which had been occupied by employees of the War Department engaged in improving the entrance to the harbor, were transferred back to the Light-House Establishment.

41, 42, 43. Humboldt Bay, California.—There are three lights maintained on the jetties to guide vessels in over the bar. These, however, are ineffective in thick or foggy weather by day or night. It is evident that a fog-signal is much needed here. It is estimated that a proper fog-signal can be established on either the north or south jetty at a cost not to exceed $15,000. The Board therefore recommends that an appropriation of this amount be made therefor.

44. Humboldt Beacon No. 1.—This lighted beacon, which was destroyed by a vessel running against it, was rebuilt.

47. Trinidad Head, Pacific Ocean, California.—The fog bell was put in operation July 15, 1898. General repairs were made at this station. A portion of the joists and flooring of the dwelling were renewed, a flush-tank water-closet with a vitrified stone sewer was put in, a new 10,000-gallon tank was erected on a concrete foundation, and new gutters and leader pipes were placed on the roof and connected with the tanks. An appropriation of $250 was made by the act approved March 3, 1899, for a telephone line from this station to connect with the general telephone system at Trinidad. Arrangements have been made for its construction.

49. St. George Reef, on Northwest Seal Rock, St. George Reef, off Point St. George, seacoast of California.—A derrick was erected on the wharf in Crescent City to lift the light-house launch out of the water when the keepers are ashore. Various repairs were made.

REPAIRS.

During the fiscal year repairs and renovations, more or less extensive, were made at the following-named stations:

10. Point Conception, Cal.
12. Piedras Blancas, Cal.
15. Santa Cruz, Cal.
19. Farallon, Cal.
22. Fort Point, Cal.
23. Lime Point, Cal.
24. Angel Island, Cal.
26. Yerba Buena, Cal.
33. Roe Island, Cal.
37. Point Reyes, Cal.
42. Humboldt Bay.
48. Crescent City, Cal.

LIGHT-VESSELS.

20. San Francisco light-vessel No. 70, California.—This composite steam light-vessel, built in 1897–98, of about 400 tons burden, was placed on her station April 7, 1898, in 18⅙ fathoms of water, about 3¼ miles outside the bar off the entrance to San Francisco Harbor. She carries a steam fog-signal and shows electric lights. In order to obtain a wider range for the fog-signal, the whistle was raised to the same height as the smokestack, and by using the main boiler, which is found to be more economical than the donkey boilers, the most satisfactory results have been obtained. The electric lights have given entire satisfaction. During a severe storm in January the patent riding stopper was broken into several pieces. As soon as the storm moderated, the stopper from the port side was shifted to the riding chain and a new stopper made in San Francisco. On Sunday, May 14, 1899, at 5 p. m., this vessel broke adrift from her moorings during a severe northwest gale. The weather was clear and the sea was large and increasing, and the ship was riding with 90 fathoms chain. Upon heaving in the chain to 60 fathoms it was found that the shackle was missing. As it was impossible under the circumstances to moor the vessel with her small anchor, she steamed to Yerba Buena depot. After obtaining a new set of moorings, the vessel returned to her station on Tuesday morning, May 16, 1899, at 8 a. m., after an absence of 39 hours. When the foggy season is over this vessel will be brought in to have her decks calked, her boilers repaired, and her electric engines overhauled. A new boat will be supplied her in place of the cumbersome metallic lifeboat now on board. An arrangement has been made with the gasoline schooner *Ida A.* to stop at this light-vessel once every other week on her way to and from the Farallon islands, to transport mails, men, and supplies. During the past year this vessel consumed 83 tons of coal to operate the fog-signal alone, 285 tons for the electric lights, and 173 tons additional for all other purposes, making a sum total of 541 tons.

—. *Relief light-vessel for the Twelfth and Thirteenth light-house districts, Pacific coast.*—The following recommendation, made in the Board's last two annual reports, is renewed:

There are now three light-vessels stationed at important points on the Pacific coast—one in the Twelfth and two in the Thirteenth light-house districts. If it becomes necessary to temporarily withdraw any one of these vessels, there is no relief light-vessel to replace it. Such a vessel is urgently needed. It is estimated that one can be built for not exceeding $80,000, and it is recommended that an appropriation of this amount be made therefor.

—. *Blunt's Reef light-vessel, Pacific Ocean, off Cape Mendocino, California.*—The following recommendation, made in the Board's last annual report, is renewed:

Officers of the Revenue-Cutter Service and of the Coast and Geodetic Survey in the spring of 1898 called the attention of the Board to the need of additional aids to navigation at this point. Cape Mendocino forms a projecting angle into the Pacific Ocean, and is the turning point for vessels bound up or down the coast, and it is important that vessels bound up or down the coast should be able at all times to know when this point is reached. The light shown at Cape Mendocino is sufficient on clear nights, but in thick weather it is of little, if any, use, and the light-station here is without a fog-signal. Blunt's Reef is dreaded by coasting sailors, as will be evident from the following extract from The Pacific Coast Pilot:

"For many years the passage between the reef and the cape was generally used by coasting steamers and lumber vessels, but the examinations of 1870 and 1872 have shown the passage to be a very dangerous locality, and the insurance companies will not underwrite vessels using it."

The chart of the vicinity shows that Blunt's Reef is nearly 3 miles from the cape. The Board is of opinion that a first-class light-vessel, with steam power, steam fog-signal, and an electric light should be placed off Blunt's Reef. It is estimated that such a vessel can be built for $90,000, and it is recommended that an appropriation of this amount be made therefor.

DAY OR UNLIGHTED BEACONS.

Beacon No. —, San Diego Harbor, California.—A single-pile beacon crowned with diamond, painted black. This beacon was destroyed

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September 24, 1898, and rebuilt November 12, 1898, alongside of the stump of the former beacon.

Beacon No. 4, San Pedro Harbor, California.—A single-pile beacon crossed with boards, painted red and marked with figure 4 in white. This beacon was destroyed January 23, 1899, and rebuilt February 24, 1899.

Beacon No. 3, San Pedro Harbor, California.—A single-pile beacon crossed with boards, painted black and marked with figure 3 in white. This beacon was destroyed November 23, 1898, and rebuilt January 23, 1899.

Shoal at entrance to Mare Island Strait, California.—This beacon, red and black horizontal stripes, which was destroyed January 20, 1899, was rebuilt February 12, 1899, in 12 feet of water, about 600 feet N. by E. from its former position, and did not mark the tail of the shoal. The beacon was taken down and rebuilt in its proper position March 22, 1897. The structure is a frustrum of a triangular pyramid of three piles, crossed with slats, and its top is 18 feet above the water.

Beacon No. 1, Petaluma Inlet, San Pablo Bay, California.—A three-pile beacon crossed with slats, painted black and marked with figure 1 in white. This beacon was destroyed January 10, 1899, and rebuilt February 18, 1899.

Beacon No. 2, Petaluma Inlet, San Pablo Bay, California.—A single-pile beacon crossed with boards, painted red and marked with figure 2 in white. This beacon was destroyed September 22, 1898, and rebuilt November 18, 1898.

Beacon No. 3, Petaluma Inlet, San Pablo Bay, California.—A three-pile beacon crowned with box, painted black and marked with figure 3 in white. This beacon is in bad condition and will soon be rebuilt.

Beacon No. 2½, Petaluma Inlet, San Pablo Bay, California.—A three-pile beacon crossed with slats, painted red and marked with figures 2½ in white. This new beacon was established November 18, 1898.

Beacon No. 5, Petaluma Inlet, San Pablo Bay, California.—A 3-pile beacon crowned with box, painted black and marked with figure 5 in white. This beacon is in bad condition and will soon be rebuilt.

Beacon No. 4, Petaluma Inlet, San Pablo Bay, California.—A 3-pile beacon crossed with slats, painted red and marked with figure 4 in white. This beacon was destroyed December 24, 1898, and rebuilt February 18, 1899.

Middle Point beacon, Suisun Bay, California.—This is a Coast Survey signal, whitewashed, on the mainland about 150 feet from the extreme point, and answers for the single-pile beacon which formerly marked this spot.

Stake Point beacon, Suisun Bay, California.—This is a Coast Survey signal, whitewashed, at the end of the point, and answers for the single-pile beacon which formerly marked this spot.

FOG-SIGNALS OPERATED BY STEAM.

10. Point Conception, California.—The 12-inch steam whistles, in duplicate, were in operation some 409 hours, and consumed about 4 tons of coal.

11. San Luis Obispo, California.—The 10-inch steam whistles, in duplicate, were in operation some 1,252 hours, and consumed about 80 tons of coal.

13. Point Sur, California.—The 12-inch steam whistles, in duplicate, were in operation some 990 hours, and consumed about 97 cords of wood.

16. Año Nuevo Island, California.—The 12-inch steam whistles, in duplicate, were in operation some 1,041 hours, and consumed about 63 tons of coal.

17. Pigeon Point, California.—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 893 hours, and consumed about 77 cords of wood.

18. Point Montara, California.—The 12-inch steam whistles, in duplicate, were in operation some 863 hours, and consumed about 77 tons of coal.

19. Farallon, California.—The first-class steam siren, in duplicate, was in operation some 1,068 hours, and consumed about 68 tons of coal.

20. San Francisco light-vessel, No. 70, California.—The 12-inch steam chime whistle was in operation some 1,045 hours, and consumed about 83 tons of coal.

21. Bonita Point, California.—The first-class steam siren, in duplicate, was in operation some 1,443 hours, and consumed about 115 tons of coal.

23. Lime Point, California.—The 12-inch steam whistles, in duplicate, were in operation some 934 hours, and consumed about 87 tons of coal.

26. Yerba Buena, California.—The 10-inch steam whistles, in duplicate, were in operation some 156 hours, and consumed about 17 tons of coal.

31. East Brother Island, California.—The 12-inch steam whistle was in operation some 267 hours, and consumed about 22 tons of coal.

37. Point Reyes, California.—The 12-inch steam whistles, in duplicate, were in operation some 1,523 hours, and consumed about 115 tons of coal.

38. Point Arena, California.—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 1,330 hours, and consumed about 97 cords of wood.

40. Humboldt, California.—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 914 hours, and consumed about 56 cords of wood.

49. St. George Reef, California.—The 12-inch steam whistles, in duplicate, were in operation some 613 hours, and consumed about 34 tons of coal.

BUOYAGE.

The buoyage of the district is in excellent condition and all buoys are in place.

WHISTLING BUOYS IN POSITION.

San Diego Bar, California.—A second-class whistling buoy, painted black and white perpendicular stripes and marked "S. D.," in good condition.

Point Vincente, California.—A second-class whistling buoy, painted red and marked "Pt. V.," in good condition.

Point Hueneme, California.—A second-class whistling buoy, painted red and marked "Pt. H.," in good condition.

Point Arguello, California.—A second-class whistling buoy, painted red and marked "Pt. A.," in good condition.

Point Buchon, California.—A second-class whistling buoy, painted red and marked "Pt. B.," in good condition.

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Piedras Blancas, California.—A second-class whistling buoy, painted red and marked "P. B.," in good condition.

Point Pinos, California.—A second-class whistling buoy, painted red and marked "Pt. P.," in good condition.

Santa Cruz, California.—A second-class whistling buoy, painted black and white perpendicular stripes and marked "S. C.," in good condition.

Duxbury Reef, California.—A second-class whistling buoy, painted black and marked "Duxbury Reef," in good condition.

Saunders Reef, California.—A second-class whistling buoy, painted red and marked "S. R.," in good condition.

Fort Bragg Landing, California.—A second-class whistling buoy, painted black and white perpendicular stripes and marked "F. B.," in good condition.

Blunts Reef, Cape Mendocino, California.—A first-class whistling buoy, painted red and marked "Blunt," in good condition.

Humboldt Bar, California.—A second-class whistling buoy, painted black and white perpendicular stripes and marked "H. B.," in good condition.

Crescent City, California.—A second-class whistling buoy, painted black and white perpendicular stripes and marked "C. C.," in good condition.

NOTE.—The Board has authorized the establishment of a whistling buoy off Santa Barbara, Cal., as a guide for entering in foggy weather. It will be placed in August.

BELL BUOYS IN POSITION.

San Diego Bar, California.—A first-class bell buoy, painted black and white perpendicular stripes and marked "S. D.," in good condition.

San Pedro Bay, California.—A first-class bell buoy, painted red and black horizontal stripes and marked "S. P.," in good condition.

San Luis Obispo Bay, California.—A first-class bell buoy, painted red and black horizontal stripes and marked "S. L.," in good condition.

Mouse Rock, Estero Bay, California.—A first-class bell buoy, painted black and marked with the letters "M. R." in white, in good condition.

Monterey Bay, California.—A first-class bell buoy, painted red and marked with the letter "M." in white, in good condition.

Noonday Rock, California.—An improved first-class bell buoy, painted red and black horizontal stripes and marked "Noonday Rock," in good condition.

Mile Rock, California.—An improved first-class bell buoy, painted red and black horizontal stripes, in good condition.

Point Arena, California.—A first-class bell buoy, painted black and white perpendicular stripes and marked "Pt. Arena," in good condition.

Point Delgada, California.—A first class bell buoy, painted black and marked "Delgada" in white, in good condition.

Humboldt Bar, California.—A first class bell buoy, painted black and white perpendicular stripes, in good condition.

Crescent City, California.—A first-class bell buoy, painted black and marked "C. C.," in good condition.

DEPOTS.

Yerba Buena Island.—The blacksmith shop built last year was found to be too small for the heavy forging now done at the depot. It was therefore enlarged by building an addition 12 feet long on one end. A new brick forge was put in and a large bellows attached to the old forge, the old bellows being used on the new one. The wharf was repaired where damaged by an accident. The steel and iron substructure of the wharf was scraped, and painted with antifouling and anticorrosive compositions. The water-supply system installed last year, to protect the buildings and station from fire, was tested during June, when the grass on the island caught fire and the flames swept to within 150 feet of the reservation. The water was turned on from the cistern while getting up steam on the pump boiler. The water in the cistern was reduced only a little over 1 foot by the time the pump was started and salt water delivered to the fire hydrants. The employees were enabled to keep the fire under control and at no time was the station in serious danger.

The dwelling of the depot keeper is situated on the flat at the base of the hill, and the grounds were protected from the waters of the bay by a stone retaining wall. During the past winter a violent southerly storm drove the sea against this wall and undermined it, causing a large portion of it to fall and expose the earth around it to erosion. Much land was washed away.

TENDERS.

Madroño.—This iron screw steamer was built in 1885, is of about 412 tons burden, and was employed during the year in attending to the buoyage, supply, and inspection of the district, as follows: Changed, placed, or replaced 124 buoys; painted or repaired 34 beacons; landed some 1,302 tons of coal at 24 stations; delivered supplies at 35 stations; conveyed the inspector to all the stations except Cape Mendocino and Humboldt, which are visited by other means of conveyance, making 102 inspections during the year. In doing this she steamed 7,846 miles upon a consumption of 754 tons of bituminous coal. The crew were employed at the depot 1,075 hours.

The vessel was laid up for forty-two days for repairs to her hull and machinery. Leaky seams in furnaces of the boilers were calked and a temporary soft patch was put in the lower connection. Soft patches in the lower and back connections of boilers were renewed. A hard patch was put in the corner of the furnace of the port boiler, and one was put on the door frame of the starboard boiler. Leaky rivets and socket bolts were redriven. A valve for the sanitary pump was put on the strainer box of the main injector. A new Dow pump for sanitary purposes was put in the lower engine room and connected up. The lower connections of both boilers were again soft patched. The hard patch in the furnace and on the door frame were reriveted and a set of Mailer grate bars were furnished. All leaky rivets and bolts were renewed and a new set of main feed-pump valves were furnished. Plans and specifications for new boilers, to take the places of those which have been in use for fourteen years, were designed, and bids for constructing and installing them were opened in San Francisco on November 28, 1898. All the bids were rejected and important changes were made in the plans and specifications. In the new specifications bids were asked for the construction of the boilers alone, with steam drum and smokestack, to be delivered at the Mare Island Navy-Yard ready to be lowered into their saddles, and authority was obtained to have the necessary work of installation done at the navy-yard. Notices were sent to prominent firms in the East, on the Great Lakes, and on the Pacific coast, asking bids for building the boilers alone, and those bids were opened in San Francisco on July 7, 1899. The contract was signed July 14, 1899, and the work will be advanced as rapidly as practicable. The vessel was docked on January 16, 1899, thoroughly cleaned, and painted with two coats. A new suit of sails was furnished. A navigational sounding machine was installed, the anchor was repaired, and slight repairs were made to the rudder. The ship's boats, rigging, etc., are in fair condition. The surfboat has seen thirteen years' hard service and must soon be replaced. A new whaleboat is authorized, and electric lights and a steam steering gear are to be installed. The change in the boilers will make it necessary to make certain changes in the bulkheads and to do other work on the hull. This work will be done at the Mare Island Navy-Yard when the new boilers are installed.

The Madroño's steam launch.—This launch, which is used for communicating with the depot on Yerba Buena Island and for distributing supplies to the harbor stations, etc., is in good condition. During the year only small repairs were made. She is in excellent condition.

Steam launch Hazel.—This small wooden steam screw launch was used during the year in attending construction parties at the bay stations. In November and again in June she was taken from the water and scraped and painted. Slight repairs to hull and machinery were made during the year.

Tender for the engineer of the Twelfth light-house district.—The following recommendation, made in the Board's last annual report, is renewed:

> There is now no tender for the engineer service of this important district. The only tender that can go to sea is almost constantly employed by the inspector in supplying and inspecting the light-stations and in caring for its buoys. The steam launch can be used only in the sheltered waters of San Francisco Bay. An additional tender is much needed, capable of attending to construction and repair work at the several exposed stations of this district, which extends along the Pacific coast from the boundary between California and Mexico to the boundary between California and Oregon. It is estimated that a proper tender for this duty can be built for not exceeding $90,000, and it is recommended that an appropriation of this amount be made therefor.

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THIRTEENTH DISTRICT.

This district extends from the boundary between California and Oregon to the northern boundary of the United States, and includes Alaska. It embraces all aids to navigation on the seacoasts of Oregon and Washington, and the United States waters of the Strait of Juan de Fuca, Washington Sound, and the Gulf of Georgia, and on the tidal waters tributary to the sea, strait, sound, and gulf between the limits named, together with those on Alaskan waters.

Inspector.—Commander John C. Morong, United States Navy, to October 14, 1898; Capt. George C. Reiter, United States Navy, to June 30, 1899; since then Commander W. L. Field, United States Navy.

Engineer.—Capt. Walter L. Fisk, Corps of Engineers, United States Army, to June 30, 1899; since then Capt. William C. Langfitt, Corps of Engineers, United States Army.

There are in this district—

Light-houses and beacon lights, including 98 post lights	137
Light-vessels in position	2
Day or unlighted beacons	46
Fog-signals operated by steam, caloric, or oil engines	14
Fog-signals operated by clockwork	5
Whistling buoys in position	7
Bell buoys in position	5
Other buoys in position	272
Steamer *Manzanita*, buoy tender, and for supply and inspection	1
Steamer *Columbine*, for construction and repairs	1

LIGHT-STATIONS.

50. Cape Blanco, Oregon.—The following recommendation, made in the Board's last two annual reports, is renewed:

> The quarters are insufficient for the three keepers. They can not be added to or altered to meet the needs of the station. It is estimated that a suitable new building can be erected for not exceeding $4,500, and it is recommended that an appropriation of that amount be made therefor.

51. Coquille River, Oregon.—The water supply of the fog-signal being inadequate, a 5,000-gallon redwood water tank was erected on a trestle foundation 8 feet high. The brick piers under the barn were rebuilt and brush and rock piled around them to protect them from being undermined by the wind blowing the sand away. Both the fog-signal and lighting apparatus were put in good condition, and fourth-order Funck-Heap lamps were installed in place of the old ones. Various repairs were made.

52. Cape Arago, Oregon.—The footbridge between the mainland and island upon which the buildings are situated was completed on July 28, 1898. The water supply for the fog-signal being inadequate, a 5,000-gallon redwood water tank was erected on the south side of the fog-signal building and connected with the iron tank. The fog-signal apparatus was put in good condition. The lighting apparatus was overhauled and fourth-order Funck-Heap lamps were installed in place of the old ones. A quantity of brush and rock was placed around the foundation of the boathouse to prevent the sand from washing out. Various repairs were made.

Thirteenth District.

67. Yaquina Head, Oregon.—The quarters furnished the three keepers are insufficient for their needs. These quarters can not be added to or altered to meet the needs of the station. A new building is required. It is estimated that a suitable one can be erected for not exceeding $4,000, and the Board recommends that an appropriation of that amount be made therefor.

—. *Coos Bay lights, Oregon.*—Two additional lights were erected during January, 1899. The number of light-keepers allowed under the law is so nearly complete that the Board is unable to provide light-keepers for these lights.

69. Tillamook Rock, Oregon.—The work of raising the roof of the building at this station some 5 feet and putting on a new roof consisting of steel I-beams and concrete, and which was in progress at the end of the last fiscal year, was completed during the month of September, 1898. The fog-signal and lighting apparatus were thoroughly overhauled and put in good condition. The hoisting apparatus was also overhauled and put in good condition. The telephone cable between the mainland and the rock upon which the station is located parted during the heavy storms of last winter.

—. *Point Adams, Oregon.*—The act approved June 11, 1896, appropriated $11,000 for discontinuing this light and reestablishing it with a fog-signal at or near the outer end of the wharf at Fort Stevens, near the mouth of the Columbia River, Oregon. The station was discontinued January 31, 1899, and the illuminating apparatus was stored at the buoy depot.

71. Fort Stevens, Oregon.—The act approved June 11, 1896, appropriated $11,000 for discontinuing Point Adams Light and reestablishing it with a fog-signal near the outer end of the Fort Stevens wharf. On March 23, 1897, the site was selected, but at that time the site was in dispute between the War Department and private parties. This matter was duly settled by the United States court. The following statement appeared in the Board's last annual report:

> Any other site than the one selected would interfere with the use of batteries under construction at this place. It is proposed that instead of this light and fog-signal station a suitable structure be erected near the present position of Buoy No. 3, on Desdemona Sands, at the mouth of the Columbia River, comprising a light-house with a fourth-order light, fog-signal, and dwellings for keepers. It is estimated that the station can be built for $35,000, and recommendation is made that an appropriation of $24,000 be made, and that, in addition, the $11,000 appropriated for Fort Stevens light-station also be made available for this station.

The Board renews this recommendation.

133. North Head, Washington.—Four wrought-iron braces were put on the framework of the lens apparatus and a call-bell system was put in between the dwellings and the tower. Last fall, in order to carry surface water away from the road leading to the station, ditches were constructed, culverts put in, and banks sloped off. Various repairs were made.

On February 25, 1898, the contractor for the erection of this station filed suit in the United States circuit court against the United States to recover $5,868 damages which he claims to have sustained because of the delay in delivery of the metal work beyond the time specified. This suit was tried June 29, 1899, but up to the present time no decision has been rendered.

131. Willapa Bay, Washington.—Fourth-order Funck-Heap lamps were installed in place of old ones.

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135. Grays Harbor, Washington.—A fog-signal apparatus was received from the general light-house depot on August 23, 1898. They were old machines, much eaten with rust, and extensive repairs would have been necessary before they could have been used. On November 26, 1898, new sirens and siren engines were received, and the work of putting the machinery in place was completed February 15, 1899. The signal went into commission March 8, 1899. A call-bell system was put in between the dwellings and tower. A small house was built over the pump under the windmill tower.

—. *Slip Point, Clallam Bay, Strait of Juan de Fuca, Washington.*—The following recommendation, made in the Board's last two annual reports, is renewed:

> Owing to the great distance between the fog-signals at Cape Flattery and New Dungeness and the unsatisfactory results from the Ediz Hook fog bell, steamers plying the Straits of Juan de Fuca have great difficulty during thick and foggy weather in making this run. Numerous complaints have been made by owners and masters of the vessels. There is no fog-signal between Cape Flattery and Ediz Hook, a distance of some 70 miles. Owing to the frequency and density of fogs and smoky weather, an intermediate fog-signal is greatly needed. It is estimated that a Daboll trumpet fog-signal, with a suitable building, ground, etc., could be erected for not exceeding $7,000, and it is recommended that an appropriation of that amount be made therefor.

146. New Dungeness light and fog-signal station, Strait of Juan de Fuca, Washington.—The following recommendation, made in the Board's last four annual reports, is renewed:

> The dwellings erected at this station are arranged for the accommodation of two families and one single man; but as there are four keepers employed, and sometimes three of them with families, there is insufficient accommodation, and a new dwelling is urgently needed. The estimated cost of a suitable building, cistern, outhouse, etc., for this station is $4,000.

147. Smith Island, Washington.—Fourth-order Funck-Heap lamps were installed in place of old ones.

148. Point Wilson, Washington.—The fog-signal and lighting apparatus were put in good condition. Fourth-order Funck-Heap lamps were installed in place of old ones. The tramway leading from the beach to the fog-signal building was rebuilt. Eight new storm windows were put on the south side of the dwelling.

149. Admiralty Head, Washington.—Fourth-order Funck-Heap lamps were installed in place of the old ones. Owing to the fortification works now being constructed at this point, it has been necessary to move this station. Exchange was made of the present light-house reservation for two suitable pieces of ground near by belonging to the War Department. Plans and specifications for the new buildings were made, except the oil house, and turned over to the War Department for erection. This station was built in 1859 and established in 1860. The buildings are of wood, except the oil house, much the worse for age, leak in many places, have often been repaired, and are in fact too old and dilapidated to be worth moving. The oil house is of corrugated galvanized iron and can be moved at small expense.

153. Point No Point, Washington.—The act approved July 1, 1898, appropriated $6,000 for the establishment of a first-class fog-signal in place of present fog bell. The necessary materials, together with mechanics, etc., were landed at the station October 4, 1898, and the building was completed November 30, 1898, with exception of a cement floor, which will not be put in until machinery is placed. The building is situated in front of and connected with the brick light tower. It

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consists of engine room, oil room, closet, and passage. It is 27 feet 10 inches long, 18 feet 2 inches wide, and clear inside height of 10 feet 8 inches. The foundation and floor of concrete, walls brick, on inside of engine room furred with 1½-inch hollow tiles and all walls inside and outside cemented. The roof consists of 9-inch steel beams arched in with hollow tiles, covered with concrete and asphaltum. The gutters are molded in concrete and provided with galvanized wrought-iron leaders. The windows have stone sills. All mill work is of fir, and the window sash is of cedar. The machinery was manufactured in the East and was shipped here through the United States Quartermaster's Department on June 8, 1899. On its receipt it will be put in place. Various repairs were made.

155. *West Point, Washington.*—The fog-signal machinery was overhauled and a new smokestack put in place. New fourth-order Funck-Heap lamps were installed in place of old ones. Minor repairs were made.

156. *Battery Point post light, Puget Sound, Washington.*—The following recommendation made in the Board's last four annual reports, is renewed:

> The establishment of a fog-signal at this point is strongly urged. It is estimated that a fog bell, with suitable dwelling, grounds, etc., could be erected for $6,000, and it is recommended that an appropriation of this amount be made therefor.

158. *Robinson Point, Washington.*—A walk was built in front of the fog-signal building and a platform in front of the barn. Tubes were put in the fog-signal boiler. This boiler is now beyond repairs, and a new one has been ordered and will be put in place as soon as received. Various repairs were made.

The following recommendation, made in the Board's last two annual reports, is renewed:

> Now that there is a fog-signal here, an additional keeper is much needed. But the keeper's dwelling is barely sufficient for the present keeper and his family. An additional keeper's dwelling is therefore an urgent necessity. It is estimated that a suitable building can be erected for not exceeding $3,000, and it is recommended that an appropriation of that amount be made therefor.

159. *Point Brown post light, Puget Sound, Washington.*—The following recommendation, made in the Board's last four annual reports, is renewed:

> In addition to the stake light at this important turning point of the numerous water crafts plying between Tacoma and points down the sound, a fog-signal is urgently required. It is estimated that a bell struck by machinery could be erected, together with the necessary buildings, dwellings, etc., for about $6,000, and it is recommended that an appropriation of this amount be made therefor.

—. *Burrows Island, Rosario Strait, Washington.*—The following recommendation, made in the Board's last two annual reports, is renewed:

> There is much traffic through Rosario Strait, which will naturally increase in the future. During certain seasons of the year fog and smoke from forest fires prevail. Burrows Island is a point of departure for most of the vessels plying the strait. The tides and currents here are strong and variable, and there are several dangerous reefs in the immediate vicinity. A light and fog-signal at the southwest point of Burrows Island would be of great use to commerce and navigation. It is estimated that they could be established for not exceeding $15,000, and it is recommended that an appropriation of this amount be made therefor.

185. *Turn Point, Washington.*—The sidewalk leading from dwelling to fog-signal building was repaired. The hot-air engines operating the Daboll trumpet do not develop power enough to run the compressors. Oil-burning engines were ordered and were shipped on June 8, 1899,

through Quartermaster's Department, United States Army. When received they will be installed. They will be belted to the countershaft and compressor, using the air compressors, countershaft, etc., now there.

186. Patos Island, Washington.—An addition was built on the barn. Minor repairs were made. The hot-air engines operating the Daboll trumpet do not develop enough power to run the compressors. Oil-burning engines were ordered and were shipped through Quartermaster's Department, United States Army, on June 8, 1899. When received they will be installed. They will be belted to the countershaft and compressors, using the air compressor, countershaft, etc., now there.

187. Semiahmoo Harbor, Semiahmoo Bay, Gulf of Georgia, Puget Sound, Washington.—The following recommendation, made in the Board's last two annual reports, is renewed:

> There is now a post light at Semiahmoo. While it is useful, it is insufficient for the needs of commerce. Blaine, the principal town in these waters, has a population of some 1,500, and certain lumber interests. At Semiahmoo, on the opposite side of the bay, which is narrow, there is a large cannery. Several lines of steamers from Vancouver on the north and Tacoma on the south touch at Blaine. During the fishing season this commerce is increased by vessels running in connection with the cannery. The harbor is difficult to enter, particularly at night. A small light and a fog-signal would be of much service to commerce. It is estimated that they could be established for not exceeding $25,000, and it is recommended that an appropriation of this amount be made therefor.

REPAIRS.

Repairs, more or less extensive, were made at the following-named light-stations:

60. Umpqua River, Oreg.
61. Heceta Head, Oreg.
67. Yaquina Head, Oreg.
68. Cape Meares, Oreg.
132. Cape Disappointment, Wash.
141. Destruction Island, Wash.
143. Cape Flattery, Wash.
145. Ediz Hook, Wash.
146. New Dungeness, Wash.
151. Marrowstone Point, Wash.

POST LIGHTS.

These lights are efficient aids to navigation in the inland waters of the Columbia and Willamette rivers, Puget and Washington sounds, and their adjacent waters. One new post light was established and one discontinued. With the exception of the lights near La Conner, and those in the Skagit River, which are inaccessible to the tender, all the lights have been inspected, and, where necessary, the stakes, gallow frames, and beacons were repaired and painted. The keepers have generally done their work in a satisfactory manner, and the efficiency of this part of the service in the district is universally commended.

LIGHT-VESSELS.

70. Columbia River light-vessel No. 50, off the Columbia River Bar.—From May 6 to June 13, 1899, this composite vessel, which was built in 1891 and has a 12-inch steam fog-signal, was at Astoria, Oreg., undergoing repairs to her boiler, engines, and machinery. On June 13, 1899, she returned to her station, and the "light-ship's moorings" buoy, which temporarily marked her position, was discontinued. The vessel is now in good order and condition.

142. Umatilla Reef light-vessel No. 67, seacoast of Washington.—This composite vessel was built in 1891, is of about 263 tons, has an electric light and a 12-inch steam fog-signal. She was continuously on her station during the past year and is in good order and condition. On August 4, 1898, the vessel parted her moorings, and 150 fathoms of chain and a mushroom anchor were lost; but, as the weather was favorable at the time, she was able, by the use of her harbor anchor, to remain on her station until new moorings were furnished, three days later. The use of this light-vessel is highly commended by the coast steamships.

Relief light-vessel for the Twelfth and Thirteenth light-house districts, Pacific coast.—The following recommendation, made in the Board's last two annual reports, is renewed:

> There are now three light-vessels stationed at important points on the Pacific coast, one in the Twelfth and two in the Thirteenth light-house districts. If it becomes necessary to temporarily withdraw any one of these vessels there is no relief light-vessel to replace it. Such a vessel is urgently needed. It is estimated that one can be built for not exceeding $80,000, and it is recommended that an appropriation of this amount be made therefor.

DAY OR UNLIGHTED BEACONS.

Beacon 1. Columbia River, Oregon.—On May 15, 1899, the fixed white light on this beacon was discontinued. The beacon is in good condition.

The day beacons were overhauled, renovated, and many of those in Alaskan waters were entirely rebuilt. All are in good condition. One new beacon was established during the year.

FOG-SIGNALS OPERATED BY STEAM OR HOT AIR.

51. Coquille River, Oregon.—The Daboll trumpet was in operation some 419 hours, and consumed about 9 tons of coal.

52. Cape Arago, Oregon.—The Daboll trumpet was in operation some 511 hours, and consumed about 7 tons of coal.

69. Tillamook Rock, Oregon.—The first-class siren was in operation some 134 hours, and consumed 10 tons of coal. This does not include the coal used for heating, etc., or for the hoisting engine.

70. Columbia River light-vessel, No. 50, Washington.—The 12-inch steam whistle was in operation some 701 hours, and consumed about 50 tons of coal. This does not include the coal used for heating, distilling, or other purposes.

135. Grays Harbor, Washington.—The first-class siren at this station was in operation some 33 hours, and consumed about 3 tons of coal since it was established on March 8, 1899.

141. Destruction Island, Washington.—The first-class siren was in operation some 706 hours, and consumed about 40 tons of coal. This does not include the coal used for the hoisting engine, etc.

142. Umatilla Reef light-vessel, No. 67, Washington.—The 12-inch steam whistle was in operation some 481 hours, and consumed about 26 tons of coal. This does not include the coal used for running the electric-light plant, heating, distilling, or other purposes,

143. Cape Flattery, Washington.—The 12-inch steam whistle was in operation some 571 hours, and consumed 48 tons of coal.

146. New Dungeness, Washington.—The 12-inch steam whistle was in operation some 486 hours, and consumed about 40 tons of coal.

148. Point Wilson, Washington.—The 12-inch steam whistle was in operation some 337 hours, and consumed about 32 tons of coal.

155. West Point, Washington.—The Daboll trumpet was in operation some 236 hours, and consumed about 2 tons of coal.

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158. Robinson Point, Washington.—The 12-inch steam whistle was in operation some 63 hours, and consumed about 4 tons of coal.

185. Turn Point, Washington.—The Daboll trumpet was in operation some 300 hours, and consumed about 1 ton of coal.

186. Patos Islands, Washington.—The Daboll trumpet was in operation some 254 hours, and consumed about 2 tons of coal.

BUOYAGE.

During the year 3 buoys were established and 2 discontinued. The buoyage of the district is in good condition. The buoys which can be reached by the tender were changed within the past six months, but, owing to work the *Manzanita* was called upon to do, the buoy work could not in some cases be attended to as promptly as was desired. The 7 whistling and 5 bell buoys are in good order.

DEPOTS.

Tongue Point, Columbia River, Oregon.—The stairway and sidewalk between inner warehouse and dwelling and sidewalk around the dwelling were repaired, and the old incline from rear of inner warehouse was removed and a new platform put in, with steps leading to upper sidewalks. A large quantity of drift was removed from beneath the inner warehouse and the foundation was repaired by putting in 45 concrete piers, 24 inches at bottom, 20 inches at top, and 18 inches deep, with 3-inch by 12-inch cedar blocks bedded in cement mortar and 12-inch by 12-inch posts for support of building. New sills on each side of building under doorway were also put in, and new flooring in doorway.

The recommendation made in the Board's annual report for the last four years, to erect two inexpensive oil houses, such as are used at various light-stations, on solid ground at the end of the wharf, is renewed:

> The danger from fire to the mineral oil stored in the wooden building on the wharf is very great, and is occasioned by the cinders coming from passing river steamers which use wood for fuel. It is proposed to connect the depot wharf with the oil houses by a track over which a hand car can be propelled. It is estimated that these improvements can be made for $5,000, and it is recommended that an appropriation of this amount be made therefor.

There is not room enough at this depot for engineer stores. It is proposed to erect a suitable building on the shore north of the inner warehouse. It is estimated that this can be done for not exceeding $4,000, and the Board recommends that an appropriation of this amount be made therefor.

TENDERS.

Manzanita.—This wooden screw steamer was built in 1879 and is of 450 tons burden. She is in good order and condition. During the year she steamed some 20,033 miles on about 1,382 tons of coal. She was under steam some 329 days, landed 711 tons of coal at light-stations and on light-vessels, set, changed, or renovated 169 buoys, repaired and painted, or rebuilt, 25 beacons, made 41 inspection trips, landed 815 tons of freight at light and fog-signal stations, and, when not otherwise employed, was engaged at the buoy depot in the work of the district. During March, April, May, and June the tender was in Alaskan waters attending to the buoyage, which was placed in first-class condition.

Thirteenth District.

Columbine.—This steel screw steamer was built in 1892 and is of about 424 tons burden. She was used for construction and repairs, and besides renovated 12 beacons, and set, changed, and renovated 143 buoys, landed 120 tons of coal and 42 tons of freight for the light-house inspector, and, when not otherwise employed, was engaged at the buoy depot in the work of the district. During this time she received various repairs to her machinery. On February 11, 1899, the steamer was taken into dry dock, cleaned, and received a coat of anticorrosive compound, and a coat of antifouling compound was applied. She steamed about 13,862 nautical miles and consumed about 1,554 long tons of coal.

New tender for the Thirteenth light-house district.—By the act approved March 3, 1899, $100,000 was appropriated for the construction of a large, powerful, seagoing tender for the Thirteenth light-house district. Plans for this vessel are in course of preparation.

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FOURTEENTH DISTRICT.

The Fourteenth district extends on the Ohio River from Pittsburg, ., to Cairo, Ill., 966 miles; on the Tennessee River, 255½ miles, and the Great Kanawha, 73½ miles; in all, a distance of 1,295 miles, and braces all the aids to navigation within these limits.

Inspector.—Maj. William H. Bixby, Corps of Engineers, United States rmy, to March 13, 1899; since then Commander Charles T. Forse, nited States Navy.

Engineer.—Maj. William H. Bixby, Corps of Engineers, United States rmy.

There are in the district—

t lights	501
ating lights	42
ht-keepers	492
am tender *Goldenrod*, for supply and inspection	1
mber of day marks	5

The lights on the Tennessee River above Waterloo were not visited ring the year on account of low water, but supplies sufficient to main- in them were sent to the keepers. On the last trip, which ended June , 1899, everything was left in excellent condition. During this trip me new posts were set, repairs were made, and all posts and fixtures re painted. Trees and brush interfering or likely to interfere with e lights were cleared away. Sufficient supplies were left at each sta- n to maintain them through any probable continuance of low water. he light-keepers for the most part have performed their services well. asters and pilots have as usual recommended such changes as were cessary, and refer to this district in complimentary terms. During e year six lights were discontinued, having become no longer neces- ry, and three were established.

RECAPITULATION.

tal number of lights	543
umber of post lights	501
umber of floating lights	42
umber of day marks	5
umber of light-keepers	492
umber of posts established	3
umber of post lights discontinued	6
umber of posts moved	9
umber of posts reset	136
umber of trees cut	13,343
umber of acres of brush cleared	60
umber of gallons of oil distributed	15,919

TENDER.

Goldenrod.—This steel stern-wheel steamer was built in 1888, and is of about 144 tons burden. During July, 1898, she was taken out on the marine ways and thoroughly overhauled, her hull was scraped and painted inside and out, and new plates were put in where needed. In June, her steam pipes and the tops of her boilers were covered and her furnace was fitted with new grate bars and side linings. In December, 1898, a new steel tank was put in for condensed water which has greatly improved her supply of drinking water. She steamed some 5,300 miles and consumed about 718 tons of coal.

FIFTEENTH DISTRICT.

The Fifteenth district extends on the Mississippi River from the he of navigation to Cairo, Ill.; on the Missouri River to Kansas City, M and on the Illinois River from La Salle to its mouth, being in all a d tance of 1,582½ miles, and embraces all the aids to navigation with these limits.

Inspector.—Lieut. A. B. Wyckoff, United States Navy, to January 1899; since then Commander Henry B. Mansfield, United States Nav

Engineer.—Lieut. Col. Amos Stickney, Corps of Engineers, Unit States Army.

Number of fixed and floating lights on June 30, 1899	
Lights established	
Lights discontinued	
Number of keepers	
Number of channel marks	
Number of trees cut down above 4 inches in diameter	1, 8
Number of acres cleared of willows and underbrush	
Number of gallons of oil issued	9, 7
Wicks issued, gross	
Steamer *Lily*, for supply and inspection	

There were four trips of inspection and supply made on the Upp Mississippi River, seven on the Lower Mississippi, and two on the Il nois River.

The winter of 1898–99 was exceedingly cold. Navigation was close by ice on the Mississippi River between Cairo and St. Louis, and th lights were discontinued during the latter part of December and th greater part of January and February. Navigation closed between S Paul and Hastings on November 13, between Hastings and Keokuk o November 16, between Keokuk and Quincy on November 26, betwee Quincy and Hamburg on November 16, and between Hamburg and St Louis on November 30, 1898. On the Illinois River navigation was closed between Sand Point and Peoria on November 15, between Peoria and Beardstown on November 18, and between Beardstown and the mouth of the Illinois River on November 28, 1898. The lights in the Missouri River were not shown during the fiscal year, as no boats were navigating that river. Several outfits of lamps and oil were destroyed during the past winter by the destruction of keeper's houses by fire. The keepers as a rule were attentive to their duties, and the efficiency of the district well maintained. The cold winter caused a late spring and navigation opened late.

The lights on the Mississippi River were lighted between St. Paul and Reeds Landing on April 29, between Reeds Landing and Clinton on April 22, between Clinton and Rock Island on April 8, between Rock Island and Burlington on March 29, between Burlington and Keokuk on April 5, between Keokuk and Quincy on March 29, between Quincy and Hamburg on April 1, between Hamburg and Grafton on March 17, and between Grafton and St. Louis on March 18, 1899. The lights on the Illinois River were lighted between Sand Point and Peoria on March 28, and between Peoria and the mouth of the Illinois River on March 18, 1899. A good boating stage of water prevailed during the time of open navigation.

Fifteenth District.

TENDER.

Lily.—This wooden side-wheel steamer was built in 1875, and is of about 200 tons burden. She made 13 trips of supply and inspection, 4 on the Upper Mississippi, 7 on the Lower Mississippi River, and 2 on the Illinois River, in doing which she steamed about 6,731 miles and consumed some 1,096 tons of bituminous coal, or 27,397 bushels. Her hull was repaired at St. Louis in the spring of 1899, and the repairs consisted of replacing some rotten planks and putting in a number of false floor timbers, running fore and aft stringers under the deck beams, fitting 90 stanchions between the bottom binding strakes and the overhead stringers, fitting a new backing and foundation to the main keelson aft to secure the main hog chain, and calking a number of defective butts and knuckle seams. Minor repairs were made to the engines, boilers, and upper works.

SIXTEENTH DISTRICT.

The Sixteenth district extends on the Mississippi River from Cairo, Ill., to New Orleans, La., and on the Red River a distance of 8 miles, being in all a distance of 966 miles, and embraces all the aids to navigation within these limits.

Inspector.—Capt. H. C. Newcomer, Corps of Engineers, United States Army, to January 12, 1899; since then Lieut. Commander James M. Helm, United States Navy.

Engineer.—Capt. H. C. Newcomer, Corps of Engineers, United States Army.

The detail of an officer stationed at Memphis, the headquarters of the district, has resulted in great convenience and is much preferable to the former arrangement, under which the officer assigned as engineer of the Fifteenth district and stationed in St. Louis also acted as engineer of the Sixteenth district.

In this district there are—

Post lights	358
Light-keepers	319
Laborers attending post lights dropped	40
Laborers attending post lights employed	37
Steamer *Joseph Henry*, for supply and inspection	1

POST LIGHTS.

There are in this district 358 post lights, the same number as last year, cared for by 319 laborers acting as keepers, that number being 3 less than were employed last year. The efficiency of the lights has been well maintained and satisfactory service was rendered by the keepers. On January 1, 1899, the lighting of the district was done almost wholly by tubular lanterns, either square or triangular, but carrying plain globes. Since then, however, some 75 marine signal lamps with Fresnel lens globes have been secured, and an effort was made to systematize their location, that the best lights might be placed at the places where they were most needed, particularly in the long reaches and important crossings. It is proposed to replace most of the old tubular lanterns with others having a greater illuminating capacity as rapidly as practicable. The illuminating capacity of the Fresnel lens globes has been found to be much greater than is that of the plain globes.

Complete inspections of the district were made during the first three quarters of the year. An inspection for the fourth quarter was prevented by the fact that the tender *Joseph Henry* was under repair at Mound City, Ill., from April 29 to June 30, 1899.

During the year 1,091 post lights were visited, painted, supplied, and paid; 16 post lights were established; 16 post lights were discontinued and 176 post-lights were moved; 40 laborers attending post lights were dropped from the rolls for cause and 37 laborers were employed to attend post lights. About 1,586 trees were felled, each over 4 inches in diameter; over 15 acres of willow, brush, etc., were cleared; 13,975 gallons of mineral oil and 50 gross of wicks were used in maintaining these post lights.

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